NATURAL HISTORY

OF THE

RED RIVER OF LOUISIANA.

GEOLOGY.....By President Edward Hitchcock and Dr. G. C. Shumard.

PALÆONTOLOGY..By Dr. B. F. Shumard.

ZOOLOGY.....By Captain R. B. Marcy, S. F. Baird, C. Girard, C. B. Adams, and Dr. G. C. Shumard.

BOTANY.....By Dr. John Torrey.

ETHNOLOGY.....By Captain R. B. Marcy and Prof. W. W. Turner.

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APPENDIX D.

GEOLOGY.

NOTES UPON THE SPECIMENS OF ROCKS AND MINERALS COLLECTED: BY PRESIDENT EDWARD HITCHCOCK.

REMARKS UPON THE GENERAL GEOLOGY OF THE COUNTRY TRAVERSED: BY GEO. G. SHUMARD, M. D.

APPENDIX D.

GEOLOGY.

NOTES UPON THE SPECIMENS OF ROCKS AND MINERALS COLLECTED: BY EDWARD HITCHCOCK, PRESIDENT OF AMHERST COLLEGE.

DEAR SIR: I have done what I could with the specimens you put into my hands from the Red river; but I must confess, that while these specimens, with the sections and notes by Dr. Shumard and yourself, have disclosed some interesting and valuable substances, I have found it impossible to solve several questions of importance for the want of more specimens, especially fossils. Without these, you are aware, the tertiary and secondary formations cannot be identified with any degree of certainty. Yet the whole number of species sent me does not exceed half a dozen, and several of these are so mutilated that their specific character cannot be determined. The two most important formations pointed out in your notes, and in the sections, are the gypsum deposite and that of coal; yet from the former there is not in the collection more than one species of fossil, and from the latter no specimen whatever; so that the exact place in the geological scale of these two formations is in a great measure conjectural.*

But notwithstanding these deficiencies, we do get from the specimens, and your notes, glimpses of several very valuable facts. The four most important points in your discoveries are gypsum, copper, gold, and coal. Perhaps I cannot bring out my views upon these and other points better than by describing the specimens in the order of your march, except where that was doubled upon itself. Where I can do it, and think it of any service, I shall designate by colors, upon the map of your route which you placed in my hands, the most important deposites.

At your starting point, Fort Belknap, on the Brazos river, you mention a fact of the deepest interest, viz: the occurrence of "large beds of bituminous coal." Dr. Shumard has given the following section of the strata at this place:

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* When I wrote the above I was not aware that Dr. Geo. G. Shumard was requested to report upon the palæontology of the exploration. When that report appears, probably he, or others, can draw more accurate conclusions upon some points than I have done.

1. Sub-soil, arenaceous, and of a red color, three to ten feet.

2. Black shale, soft, and rapidly disintegrating, four feet.

3. Seams of bituminous coal, two to four feet.

4. Fine-grained sandstone, yellowish gray, with fossil ferns; thickness variable.

5. Gray non-fossiliferous limestone, of unknown thickness.

Dr. Shumard says that the fossil ferns in this formation belong to "the carboniferous era." He also describes the same formation on the third day's march, some fifty miles northeast of Fort Belknap, on one of the sources of Trinity river. He describes sandstone for several subsequent days, some of it coarse and highly ferruginous, with ripple-marks, which I should suppose might belong to the same coal measures, did he not mention that strata of red loam, so abundant in all that region, lie beneath the sandstone; which could not be, if the coal belongs to the carboniferous period. Yet he mentions that the same formation as that around Fort Belknap is largely developed between Fort Washita and Fort Smith, on Arkansas river. The latter fort is not less than three hundred and fifty miles northeast of Fort Belknap. On the 3d of May he describes "large quantities of ironstone strewn over the surface," another accompaniment of the true coal.

Now, at first view it would seem almost certain that we have here a description of a genuine coal formation of the carboniferous period, not less than three hundred and fifty miles long, associated, moreover, with those valuable iron ores which in other parts of the world are connected with such deposites; for, in descending through the formation, we find, first, overlying shale, then coal, then coal sandstone, or perhaps millstone grit, and then perhaps carboniferous limestone. But it is well known that coal occurs in other rocks besides the carboniferous, as in Eastern Virginia in oolitic sandstone, and in other places in tertiary strata. These more recent coals are often of great value, as in Virginia; but they are not generally as good as those from the carboniferous strata. It becomes an important question, therefore, to determine to what geological period the coal under consideration belongs. A few specimens of the fossil ferns would decide the matter, and I trust that Dr. Shumard is right in referring them to the carboniferous era; but it is known that analogous species occur in the higher rocks; and so, coal, even in the tertiary strata, is sometimes more or less bituminous. The evidence, however, appears to me to be strong in favor of this deposite being of the carboniferous age. But in your letter of April 1st, you state some facts respecting this coal that have thrown a little doubt over my mind You say that—

"The coal formation at the Brazos is found in a coarse, dark sandstone rock, which is a solid stratum, but is easily removed in consequence of being so soft. In excavating for a well, we passed through the sandstone and the coal. The greater part of the stone was removed with the mattock; and in the coal, which was here about sixty feet below the surface, we found fossil ferns, which, unfortunately, were not preserved."

The ease with which this sandstone was removed, requiring only a mattock, corresponds better with the hardness of tertiary than of carboniferous rocks; yet, in some parts of the world, distant from igneous rocks, the sedimentary strata are but little indurated.

Your statement respecting the coal on the Brazos, and the importance of the substance to the future inhabitants of the western side of the Mississippi valley, led me to recur to the journals of other explorers, as well as your own from Fort Smith to Santa Fé, published by the government in 1850, to ascertain whether this valuable mineral does not occur in such places as to justify the inference that a large coal field may exist in that portion of our country. I have not all of the necessary works of reference at hand; but, in such as I have, I have found the following cases, including those already described:

1. Fort Belknap, on the Brazos river, latitude 33¼° to 33¾°, longitude 98° to 99°.

2. Between Forts Washita and Smith, latitude 34° to 35¼°, longitude 94½° to 96¾°.

3. On Coal creek, near the South Fork of the Canadian, eighty-eight miles from Fort Smith, in longitude 96¼°, latitude 34¾°. "Bituminous coal, used by the blacksmiths of the country, who pronounce it of an excellent quality." (See Captain Marcy's report, p. 173.)

4. North branch of Platte river, latitude 42° to 43°, longitude 104° to 107°; described by Rev. Samuel Parker, Exploring Tour, p. 73. He calls this coal "anthracite, the same, to all appearances, as he had seen in the coal basins of Pennsylvania."

5. On the same route Colonel Fremont found coal and fossil plants in latitude 41½°, and longitude 111°. The fossils greatly resembled those of the true coal measures. He also found what was probably *brown* or tertiary coal, in longitude 107°.

6. Major Emory met with "bituminous coal in abundance," in latitude 41°, longitude 105°. He was told of a bed thirty feet thick.

7. Lieutenant J. H. Simpson describes bituminous coal in beds from two to three feet thick, in latitude 36° 12′, and longitude 108° 52′; and he states it to be "coextensive with the country between the valley

of the Rio Puerco and the east base of the Sierra de Tunechá, or through a longitudinal interval of 7¾°." (Report, p. 147.)

8. Lieutenant Abert found strata, which he regarded "indubitable proof of the existence of coal," in latitude 36¼°, and longitude 104½°. (Report, p. 21.)

9. In 1818, Mr. Bringier described "a large body of blind coal (anthracite) equal in quality to the Kilkenny coal, and by far the best he had seen in the United States, immediately on the bank of the Arkansas, a little above the Pine bayou, five hundred miles from its mouth, in latitude 38°, and longitude 98°. (American Journal of Science, vol. 3. p. 41.)

10. On Monk's map of the United States, (1853,) I find two spots in Texas marked as "beds of coal," one in latitude 29°, and longitude 100°; the other in latitude 28¾°, and longitude 101°.

I might, perhaps, add that Dr. F. Roemer describes a belt of granitic and palæozoic formations, the latter of carboniferous limestone and silurian rocks, surrounded by a vast deposite of cretaceous rocks, between the Pedernales and San Saba rivers, in the northwest part of Texas. The occurrence of such rocks, especially of the carboniferous limestone, affords a strong presumption that the formation that usually lies next above this rock exists in that region.

If, now, leaving out the cases described by Fremont as most probably brown or tertiary coal, we locate the others mentioned above upon a map of the United States, we shall find a region lying between latitude 28¾° and 43°, and between longitude 94½° and 109°, containing not less than nine deposites of coal, either bituminous or anthracitic; some of them one or two hundred miles long. Its northern limit is the north branch of the Platte river; its eastern limit Fort Smith, on the Arkansas; its western limit, in the country of the Navajoes, in New Mexico, and even beyond the summit level of the Rocky mountains; and its southwestern limit the Rio Grande, in the southwest part of Texas. These limits would give a north and south diameter of one thousand miles, and an east and west diameter of six hundred and eighty miles; an extent of surface three times larger than that of all the coal fields in the United States hitherto described, which cover only two hundred and eighteen thousand square miles. Yet, in view of all the facts, I think the geologist will be led strongly to suspect that a large part of this vast region at the southwest *may be* underlaid by coal. The larger part may be, and undoubtedly is, covered by newer deposites, especially the cretaceous and the tertiary; and doubtless the older rocks

in Texas, as already described, may in some districts protrude through the coal measures. But if coal does actually exist beneath the newer rocks, it may be reached, as it has been in like instances in Europe, although no trace of it exists at the surface.

The above suggestions may seem to embrace a very wide field for a coal deposite. But on locating the several patches of coal upon a map of the United States, I was struck with one fact. Starting with the beds marked upon Monk,s map, in the southwest part of Texas, and running the eye along the range of carboniferous limestone described by Dr. Roemer, we come to the coal at Fort Belknap; next to the extensive deposite lying between Forts Washita and Smith, in the west part of Arkansas; and all the way we find ourselves almost in the range of the great coal field of Iowa and Missouri, as mapped by Dr. Owen; and it seems to me that every geologist will at once infer that the Missouri field does follow this line, not only across Arkansas, but also through the Choctaw Nation, and probably across Texas—interrupted, probably, in many places, by the protrusion of older rocks, and in others covered by newer formations. I have a considerable degree of confidence that such will ere long be found to be the fact, even if we leave out the other coal deposites farther west and northwest. And should the result of your explorations be to bring out such a development, I think you must feel rewarded for your fatigues and privations.

That some of the cases above described may turn out to be tertiary coal is quite possible, especially those along the base of the Rocky mountains; for it is well known that much farther to the north such coal is developed on a large scale, especially along Mackenzie's river, even to its mouth, on the Arctic ocean. Nor is it always easy for those not practised mineralogists to distinguish this coal, especially from anthracite. Dr. Owen describes the southernmost bed of brown coal on the Missouri (from four to six feet thick) as having "the aspect of ordinary bituminous coal," yet as "smouldering away, more like anthracite." (Report, p. 196.) Even such coal might be of great value; but I cannot believe that much of that described above, especially that on the line above indicated, will prove to be tertiary coal.

I ought to have mentioned, that among the specimens in my hands is one of lignite, collected July 3, near the sources of Red river, not far from the "Llano estacado," and within the limits of the gypsum deposite to be described. It is an exceedingly compact coal, and burns without flame, emitting a pungent but not bituminous odor. It is doubtless tertiary or cretaceous; but I think, if in large masses, it might easily be mistaken for anthracite.

From the 3d of May to June 2d, the formation passed over is, as I judge from Dr. Shumard's sections and descriptions, the predominant one along the upper part of Red river. All the appended sections of Dr. Shumard, except Nos. VI and XI, exhibit the characters and varieties of this deposite. Red clay is the most striking and abundant member; and above this we have a yellow or lighter colored sandstone, often finely laminated. As subordinate members, we have blue and yellow clay, gypsum, non-fossiliferous limestone, conglomerate, and copper ore. Overlying these strata is what Dr. Shumard calls "drift," which is surmounted by soil. Excepting the gypsum and the copper, no specimen of this formation was put into my hands; and only one petrefaction, which is a coral from the base of section No. IV, unless the fossil-wood belongs to it.

Now the question is, shall we regard this formation as tertiary, or cretaceous? With the means in my hands I feel unable to decide this question. If I am right in referring the fossil coral found in it to the genus *Scyphia*, as described by Goldfuss, (Petrefacta Germaniæ, Tab. XXXII, fig. 8,) it most probably belongs to the cretaceous period; for, of the one hundred and twenty species of this genus enumerated in Bronn's Index Paleontologicus, only one is found above the chalk. As to the fossil-wood, which I shall notice more particularly further on, it is well known to occur in almost all the fossiliferous deposites. Upon the whole, I rather lean to the opinion that these strata may belong to the cretaceous formation; though it is singular, if such be the case, that the fossil remains are so scarce, since, as we shall see, they occur abundantly in another portion of the field in which the cretaceous rocks abound.

Under these circumstances I shall speak of this deposite under the name of the Red Clay Formation, save where gypsum is very abundant, and then I call it the Gypsum Formation; and thus have I marked these rocks on your map.

The sandstone which constitutes the upper part of this formation has a slight dip, in a few places, of 2° or 3°. On the 8th of June, however, a grayish yellow sandstone is described as having a westerly dip of 40°; and on the 9th of June, "an outcrop of finely laminated, red, ferruginous sandstone" is mentioned, having an irregular northeasterly dip of 30°, as shown on section VI. The next day the strata were found standing nearly perpendicular; but whether this sandstone is the same as that lying above the red clay, is not mentioned. If it is, its great dip probably results from some local disturbance. If it is not, it is probably a protruding mass of older rock exposed by denudation or upheaval.

The branches of Red river have cut deep chasms in this formation. In some places they are spoken of as fifty, and in others as two hundred feet deep. This clay, worn away by the streams, and mechanically suspended, gives that red color to the water, from which, without doubt, was derived the name of Red river. As to the substances held in solution by the waters of that river, some further description will be desirable before mentioning them.

The red clay formation above described abuts against the Witchita mountains, occupying the lower and more level regions around their base. Here we have an outburst of unstratified rocks, which are satisfactorily represented in the specimens.

If the relative position of the red clay and sandstone on section XI is correctly shown, I should infer some disturbance in the stratified deposites, which would indicate a more recent upheaval of the mountains than might be inferred from the nature of the rocks. The principal one is a red granite, with a great predominance of feldspar, and the almost total absence of mica. Porphyry also occurs in great quantity, of a reddish color, the imbedded crystals, for the most part, being red feldspar. In the easterly part of these mountains this rock is developed on a large scale, forming smooth, rounded hills, which slope gradually down to the plain. Cache creek passes through one of these hills, forming a gorge from three hundred to four hundred feet high, with "smooth, perpendicular walls." This rock Dr. Shumard calls *porphyritic greenstone*, and one of these walls is shown on section XI. He says that the rock is slightly columnar.

The rocks of these mountains are traversed by veins of greenstone and quartz. The latter is often porous and colored by the oxide of iron. The greenstone is the most recent of the unstratified rocks among my specimens, save a single vesicular mass, broken probably from a boulder, which has all the external marks of lava. It looks more like recent lava than any specimens I have ever met among greenstone or basalt. It was collected June 15th, west of the great gypsum deposite, though in a region abounding with sandstone, and near the bluffs that form the border of the "Llano estacado." Dr. Shumard found in the bed of the Red river, near the same place, what he calls greenstone, greenstone porphyry, and trachite. The specimen to which I have referred is rather augitic than trachitic. He says, also, that he found there "black scoria, and several other specimens of volcanic rocks." Again, on approaching the Witchita mountains on the return trip, he describes one as "a truncated cone, with a basin-shaped depression in the summit." Of this he seems to have judged by looking at the mountain from a

distance. But taking all the facts into the account, I cannot but feel that there is reason to presume that volcanic agency has been active in that region more recently than the trap dykes.

I ought to add, that before reaching the Witchita mountains Dr. Shumard met with large quantities of dark-colored and cellular igneous rock, composed principally of silex and carbonate of lime, strewed over the surface. This was on the 18th of May, and on the 27th he "frequently encountered local deposites of red, scoriaceous rock." Among the specimens in my hands are some apparently more or less melted, composed of carbonate of lime and copper ore.

Again, scattered widely over the surface, numerous specimens were found of jasper, carnelian, and agate. The carnelian is deep red, but found in botryoidal, or even stalactitical masses, and they have seemed to me to resemble more those silicious nodules found in soft limestone than in trap rocks. They were found most abundantly towards the western part of the region gone over.

I ought to have mentioned that the Witchita mountains consist of numerous peaks, rising from eight hundred to nine hundred feet above the river. Mount Webster, one of the most conspicuous, was found to be 783 feet above the plain by the barometer. Twelve of these elevations were found to be composed of granite, which in many places is undergoing rapid disintegration.

We have seen in the red clay of this region a reason for the name of Red river, and the character of its waters. In the above description of the rocks of the Witchita mountains, I think we may see the origin of the red clay. The great amount of iron which they contain would produce exactly such a deposite upon their decomposition and erosion by water. And we have reason for supposing this red granite to be a quite extensive formation, as I shall shortly show.

No one at all acquainted with the rocks in which gold is found can look at the specimens you have obtained in the Witchita mountains without expecting that he shall be able to detect that metal. The porphyry, the porous quartz from veins impregnated with hydrate of iron, and the magnetic iron-sand found in the bed of Otter and Cache creeks, excite this expectation. In one of your letters you state that "the people of Texas have for a long time supposed that there was gold in the Witchita mountains, and they have attempted to make several examinations for the purpose of ascertaining the fact, but have invariably been driven away by the Indians. We searched diligently about the mountains, but could find only two very minute pieces imbedded in quartz pebbles." This, as Dr. Shumard states, was upon Otter creek, and there

occurred the ferruginous sand, which occurs also upon Cache creek in great quantities. We have not been so fortunate as to find any gold in the specimens sent, although the sand has been carefully examined, and two assays have been made of the quartz in the laboratory. Yet I can easily believe that gold must exist either among that black sand, or in the veins of ferruginous quartz—sometimes three feet wide—so common in the Witchita mountains.

It is well known that a good deal of excitement exists on this subject at the present moment in Texas; but the "gold diggings" there lie upon the upper Colorado. From some able remarks on the subject in the "Telegraph and Texan Register" of April 29th, by the editor, Francis Moore, jr., I learn that the region where the gold is found is "a belt of fifteen or twenty miles wide, which extends from the sources of the Gaudalupe, by the Enchanted Rock, to the head of Cherokee creek, a branch of the San Saba." The description of that belt which follows, as you will see, corresponds very well to the region around the Witchita mountains. "The red granite rocks here crop out above the secondary formations, and veins of quartz are found traversing the rocks in all directions. The soil is generally of a red mulatto color, caused by the decomposition of the red feldspar of the granite. These rocks resemble, it is said, those of the gold regions of California and Santa Fé. A gentleman who has recently visited the Nueces states that gold has also been found on that river; and if the report that gold has been found in the Witchita mountains be correct, it is possible that this narrow belt of primitive rocks extends quite through from the Nueces to those mountains, a distance of about four hundred miles. It is mentioned in Long's Expedition that a narrow belt of red granite is found jutting up through the prairie region on the Des Moines river, in Iowa, and it is not improbable that this is a continuation of the primitive ridge, extending by the Witchita mountains and the Enchanted Rock, to the sources of the Nueces, and it may extend far above Lake Superior." As to this northern extension of these gold-bearing rocks, I do not find much to confirm the conjecture in Dr. Owen's late able report on that region, although he does mention some red granite and some red clay; but the latter is probably alluvial. Yet, that these rocks may extend through Texas, and even much farther north, is extremely probable.

But though your discovery of gold will probably excite more attention, I feel that the great gypsum deposite of the West, which you have brought to light, will be of far more consequence to the country.

On your map I have colored this formation as you have marked it out. Yet I cannot doubt, from the descriptions and sections, that the

gypsum is embraced in the red clay formation already described, for most of this mineral occurs above the red clay, though sometimes embraced within it. Yet the importance of the gypsum justifies me in coloring that portion of these strata as the gypsum formation where it is most abundant. It is several times mentioned as occurring in other parts of the region, marked as red clay. But on the 3d of June, high bluffs were met of red and blue clay, with interstratified layers of snow-white gypsum. From this time till the 12th the same formation was found, and also from the 21st of June to the 9th of July. But your own description of this formation in your letter of November, 1852, contains a better account of its extent than I can give.

"I have traced this gypsum belt," you observe, "from the Canadian river, in a southwest direction, to near the Rio Grande, in New Mexico. It is about fifty miles wide upon the Canadian, and is embraced within the 99th and 100th degrees of west longitude. Upon the North, Middle, and South forks of Red river it is found, and upon the latter is about one hundred miles wide, and embraced within the 101st and 103d degrees of longitude. I also met with the same formation upon the Brazos river, as also upon the Colorado and Pecos rivers, but did not ascertain its width. The point where I struck it, upon the Pecos, was in longitude 104½° W.

"Wherever I have met with this gypsum I have observed all the varieties from common plaster of Paris to pure selenite; and among specimens of the latter were pieces *three feet by four, two inches in thickness*, and as perfectly transparent as any crown glass I have ever seen. It is to be regretted that I could not have brought home some of these beautiful specimens; but my means of transportation were too limited. I regard this gypsum belt as a very prominent and striking feature in the geology of that country. From its uniformity and extent I do not think there is a more perfect and beautiful formation of the kind known. I have myself traced it about three hundred and fifty miles, and it probably extends much further."

The position and thickness of the gypsum beds may be learnt from Dr. Shumard's sections, especially No. V, where they are from ten to fifteen feet thick. I do not wonder that you have been deeply impressed with the vast extent of this deposite. Prof. D. D. Owen, in his late valuable report of a geological survey of Wisconsin, Iowa, &c., (1852) describes a gypseous deposite, twenty to thirty feet thick, in the carboniferous strata, and occupying an area from two to three square miles; and he says, that "for thickness and extent, this is by far the most important bed of plaster-stone known west of the Appalachian chain, if

not in the United States." (p. 126.) Either deposite may be large enough to supply the wants of the inhabitants who may live near enough to obtain it. But the vast extent of your deposite (doubtless greater, as you say, than is at present known) will make it accessible to much the greatest number of people. Indeed, from the well known use of this substance in agriculture, as well as other arts, a knowledge of its existence must have an important bearing upon the settlement and population of northwestern Texas.

The only deposites of gypsum known to me that are more extensive than the one discovered by you, are in South America. All along the western side of the Cordilleras, especially in Chili, and interstratified with red sandstone and calcareous slate, beds of gypsum occur of enormous thickness, some of them not less than six thousand feet. It has been tilted up and metamorphosed greatly by igneous agency of ancient date, but seems to be of the age of the lower cretaceous rocks. Mr. Darwin, to whose admirable work on the geology of South America I am indebted for these facts, has traced this deposite at least five hundred miles from north to south, (it is not many miles—sometimes, however, twenty or thirty—in width,) and thinks it extends five hundred more; and perhaps much further. He also describes thin beds of gypsum in the tertiary strata of Patagonia and Chili, which are some eleven hundred miles in extent. This gypsum is generally more or less crystalline, and corresponds much better in lithological characters with that in Texas, than does the metamorphic gypsum of the Cordilleras. Mr. Darwin is of opinion, however, that the latter was originally deposited in a manner analogous to the former, viz: by means of submarine volcanoes and the conjoint action of the ocean. Very probably the ancient igneous agency which we have described in the Witchita mountains, and along a line southerly to the Rio Grande, may have been connected with the production of the gypseous deposite in the same region.

The specimens of this gypsum put into my hands correspond with your descriptions. One of them, of snowy whiteness and compact, it seems to me, might answer for delicate gypseous alabaster, so extensively wrought in other lands for ornamental purposes. The selenite was regarded among the ancients as the most delicate variety of alabaster, and was employed by the wealthy, and in palaces, for windows, under the name of *Phengites*. It has the curious property of enabling a person within the house to see all that passes abroad, while those abroad cannot see what is passing within. Hence Nero employed it in his palace. If the splendid plates which you describe occur in any considerable quantity, it may hereafter be of commercial value, as it certainly will be of mineralogical interest.

From your description, especially in your lecture before the American Geographical and Statistical Society, it is manifest that the character of the rocks changes on the northwest of the gypsum formation, and near the head of the south branch of Red river. The red clay and gypsum have disappeared, and sandstone succeeds; but of what age I have no means of judging.

Another interesting mineral found by you in the red clay and gypsum formations above described, is copper. The specimens were put into the hands of Professor Charles U. Shepard, who has analyzed them, as well as several other specimens, in the laboratory of Amherst College, and whose report I annex to my own. You will see that he has made free use of your name by attaching it to a new ore of copper, found on Red river near the Witchita mountains; and that he describes three or four other species of copper ore from the same region. For a particular description I refer you to his report, while I confine myself to a few remarks as to the geology of the deposite.

On section V, Dr. Shumard has shown the geological position of this ore, viz: near the bottom of, and in the red clay, and more than one hundred feet from the surface. We hence see that the ore was deposited from water, although some specimens from Cache creek of calcareous amygdaloid seem to have been melted. But if, as has been suggested, the gypsum was produced by the joint action of submarine volcanoes and water, the copper may have had the same origin, and this would explain the presence of chlorine in the *Marcylite*.

How much copper may be expected in such a region as that on Red river, I have no means of judging, because I know of no analogous formation. But as we have proof that it is an aqueous deposite, and that igneous agency has been active not far off, it would not be strange if the vicinity of Witchita mountains should prove a prolific locality.

The oxide of manganese described by Professor Shepard may, perhaps, be found abundant and more pure. And the iron-sand, so common in some of the creeks, indicates the existence of magnetic oxide of iron in the mountains.

Whether the red clay formation and the gypsum formation that have been described are of the cretaceous age or not, there can be no doubt as to the deposites passed over from July 20 to Fort Washita, for among the specimens are two species of *Gryphæa*, and one echinoderm, much mutilated, but evidently of that period. On the 27th, a "bluish gray, highly crystallized limestone" was observed, which cropped out beneath the sandstone, and which Dr. Shumard says was "non-fossil-

iferous." It continued, however, to the 30th, or to Fort Washita, where he says, "I observed in it a large number of the fossils characteristic of the cretaceous period." Probably he refers to two kinds of limestone, and not improbably the limestone and sandstone first noticed belong to the carboniferous strata already noticed. Among the specimens I also find parts of two species of ammonite; one quite large, but quite characteristic of the cretaceous strata, and resembling some good specimens in the collection of the American Board of Foreign Missions, obtained by their missionaries in the Choctaw country. I cannot doubt that these strata are largely developed in that vicinity. Indeed, that region has already been colored as of the cretaceous age upon our geological maps. I have, therefore, marked a strip of cretaceous rocks between Forts Belknap and Washita. These are, in truth, the predominant strata in Alabama, Mississippi, and Texas, and I need not go into details respecting them.

Dr. Shumard frequently speaks of a surface formation under the name of *drift*, consisting of boulders of all the rocks described above, and some others, such as mica slate and labradorite. But I doubt whether this formation be the same which we denominate drift in New England—the joint result of water and ice; for no example has as yet been found of drift agency as far south as Texas, by several degrees. Yet there is evidence of a southerly movement among the smaller rolled detritus almost to the Gulf of Mexico, such as water alone could produce, seeming to be the result of the same current, destitute of ice, that produced the coarse unstratified and unsorted drift of Canada and New England. But among the specimens in my hands are several of silicified wood, and all of them, I believe, are mentioned in Dr. Shumard's notes as occurring in drift; although in your letter of December 5, 1852, you speak of masses from fifty to one hundred pounds in weight in the gypsum formation. You may mean in its upper part:* if so, there may be no discrepancy between the two statements; and I have been led to suspect that what Dr. Shumard calls drift may be only a newer portion of the tertiary strata, although, as already remarked, silicified wood is found in almost all the fossiliferous formations. All the specimens sent by you, however, with one exception, are dicotyledonous. They resemble not a little the fossil-wood from Antigua, and the desert near Cairo, in Egypt; both of which deposites are tertiary. One specimen is a beautiful example of a monocotyledon, a cross sec-

*The fossil-wood referred to in Captain Marcy's letter was found upon the upper surface of the formation.

tion showing vessels of the shape of a half or gibbous moon. This fact shows that the climate was warm enough for trees analogous to the palm tribe to flourish; yet the great predominance of dicotyledonous forms shows a close analogy with the existing vegetation of the southern part of our country; nor is there evidence, in these specimens, of a temperature above that now existing in our southern States, since several species of palms occur there.

The two subsoils analyzed by Professor Shepard, give very interesting results. The first is highly calcareous; and when the lime shall have been exhausted in the overlying soil, this material, thrown up by subsoil ploughing, would be equal to a large dressing of lime. In the other subsoil we have an extraordinary amount of sulphate of lime, and a sufficiency of carbonate of lime, as well as chlorine and soda. It seems hardly possible to doubt that such a basis would need only organic matter to render it one of the most productive of all soils; and when we think how extensive the gypsum formation is from which this subsoil was obtained, we cannot but anticipate (unless there are counteracting causes of which I am ignorant) that that portion of our country will become a rich agricultural district—I mean the region lying east of the "Llano estacado."

Only one specimen of common salt (chloride of sodium) was sent among the specimens, and that, as you inform me, "was procured by the Comanche Indians in the country lying between the Canadian and Arkansas rivers."

We are now prepared to appreciate an analysis of the water of Red river, which has been executed in the laboratory of Amherst College by Mr. Daniel Putnam, under the direction of Professor W. S. Clark. This is somewhat of a mineral water, and you remark that all the waters originating in the gypsum formation have the same bitter and nauseating taste. I think you are right in the opinion that the ingredients are derived from that formation. Analysis shows that the taste depends upon the presence of three salts in nearly equal proportions, two of which, sulphate of magnesia, or Epsom salts, and chloride of sodium, are very sapid. Mr. Putnam's analysis is as follows:

"Water from Red river—

Water in fluid ounces	4
Weight of water in grammes	127.800
Weight of chlorine present	.051
Weight of lime present	.033
Weight of sulphuric acid present	.095
Residue evaporated to dryness, and weighed, *probably*, sulphates of soda and magnesia together, weight	.168

"It was impossible, with the small quantity of water, to determine the last two ingredients with *absolute certainty*. In the calculations following they are regarded as *real*. Regarding the lime as sulphate, and the residue of sulphuric acid as united with magnesia, and the chlorine as united with sodium, we have the following results:

Weight of sulphate of lime	.080
Weight of sulphate of magnesia	.073
Weight of chloride of sodium	.084
Weight of the whole	.237
Per-centage of matter in solution, about	.19

"The analysis of the water from a spring in a gypsum cave, yielded the following results:

Weight of the water, in fluid ounces	4
Weight of the water in grammes, about	127.800
Weight of hydro-sulphuric acid present	.011
Weight of chlorine	.014
Weight of lime	.090
Weight of sulphuric acid	.227

The residue was evaporated, and the *presence*, but not the weight, of magnesia, found separate from the soda. The quantity was very small, however.

Soda and magnesia together, about	.130

"Regarding the lime as sulphate, and the residue of sulphuric acid as united partly with magnesia and partly with soda, and the chlorine with sodium, we have the following results:

Weight of sulphate of lime	.219
Weight of sulphate of magnesia	.088(?)
Weight of sulphate of soda	.073(?)
Weight of chloride of sodium	.023
Weight of hydro-sulphuric acid	.011
Weight of the whole	.414
Per-centage of matter in solution	.82

"The analyses of water, on account of the small quantity, cannot be relied upon as perfectly accurate; but they are the best I could make under the circumstances."

Your account of the remarkable *cañons* of Red river, where it comes out from the borders of the "Llano estacado," as given in your lecture before the American Geographical and Statistical Society, has been read by me with great interest. For several years past I have been engaged in studying analogous phenomena in this, which seems to me a neglected part of geology. The cañons of our southwestern regions are among the most remarkable examples of erosions on the

globe; and the one on Red river seems to me to be on a more gigantic scale than any of which I have found a description. You seem in doubt whether this gorge was worn away by the river, or is the result of some paroxysmal convulsion. You will allow me to say that I have scarcely any doubt that the stream itself has done the work. The fact that when a tributary stream enters the main river it passes through a tributary cañon, seems to me to show conclusively that these gorges were produced by erosion, and not by fractures; for, how strange would it be if fractures should take those ramifications and curvatures which a river and its tributaries present. And, moreover, I find cases where I can prove, from other considerations, that streams of water (existing and ancient rivers) have eaten out gorges quite as difficult to excavate as any of the cañons of the West. So that, if we must admit that rivers have done a work equally great in one case, all presumption is removed against their doing the same in other cases. I have a great number of facts which I hope to be able, if life be spared, to present to the public on this subject; and I am very glad to add the cañons of Red river to the number.

Before Professor Adams's departure for the West Indies last winter, I secured his report, hereto subjoined, upon the recent shells collected in your expedition. It derives a melancholy interest from having been among the last, if not the very last, of his scientific efforts, he having been cut off by yellow fever in January.

With this imperfect elucidation of the facts collected by you in your laborious explorations, I subscribe myself,

With great respect,

Your obedient servant,

EDWARD HITCHCOCK.

AMHERST COLLEGE, *June* 5, 1853.

REMARKS UPON THE GENERAL GEOLOGY OF THE COUNTRY PASSED OVER BY THE EXPLORING EXPEDITION TO THE SOURCES OF RED RIVER, UNDER COMMAND OF CAPTAIN R. B. MARCY, U. S. A.: BY GEO. G. SHUMARD, M. D.

It is to be regretted that the main objects contemplated by the expedition were of such a character as to allow of merely a partial geological exploration. It was found necessary to traverse a large extent of country in a limited period of time, so that not as many opportunities were allowed for making minute and detailed sections of the strata as could have been desired. However, it is believed that something has been done towards elucidating the geology of a valuable and interesting district of our country, which hitherto has received but little attention from geologists.

We will first submit a brief account of the geological features of a portion of Northwestern Arkansas, which will enable us to understand more clearly the character of the deposites observed on the route travelled by the party, and exhibit more satisfactorily the connection of the cretaceous group with the older or palæozoic rocks. In Washington county we have a fine development of rocks belonging to the carboniferous period, rising sometimes several hundred feet above the water-level of Arkansas river. They consist of beds of dark-gray and bluish-gray limestone, surmounted by heavy-bedded coarse and fine-grained quartzose sandstone. The ridges of highest elevation run nearly north and south through the centre of the country, forming a geological back-bone; the waters from one side flowing eastwardly into White river, and on the other westwardly into Illinois river, both streams being tributaries of the Arkansas.

Wherever the limestone forms the surface-rock, the soil is of excellent character, and for productiveness is unsurpassed by any in the State; but where the sandstone reaches the surface, the soil becomes too arenaceous, and is of inferior quality for agricultural purposes. The limestone is generally highly charged with fossils, and, in many places, beds of considerable thickness are almost entirely composed of the remains of Crinoidea.

In lithological and palæontological characters it corresponds very closely to the rocks of the superior division of the carboniferous system of Indiana, Kentucky, Illinois, and Missouri. The fossils are usually remarkably well preserved. The following are the most abundant and

characteristic species: *Archimedipora archimedes*, *Agassizocrinus dactyliformis*, *Pentatematites sulcatus*, *Productus cora*, *P. punctatus*, *P. costatus*, *Terebratula subtilita*, and *Terebratula Marcyi*.* We have found all these species associated together in Grayson county, Kentucky, near Salem, Indiana, and at Chester and Kaskaskia, Illinois.

The line of junction between the sandstone and limestone is well defined, there being an abrupt transition from the one into the other. The sandstone has yielded but few fossils, and these only calamites and ferns.

Veins of sulphuret of lead traverse the limestone at several points in Washington county, and I have been informed that valuable beds of iron ore occur here; workable seams of bituminous coal have also been discovered at a number of localities in the county.

Proceeding in a southerly direction through the counties of Crawford and Sebastian, the limestone, which, with few exceptions, constitutes the surface-rock in Washington county, dips beneath the sandstone, and the latter forms the entire mass of the hills, rising sometimes to the altitude of a thousand feet above the adjacent streams: it is, for the most part, the prevailing rock the entire distance between Fort Smith and Camp Belknap. The sandstone is often highly ferruginous, and varies in color from light-gray to dark-brown. It exists in heavy massive beds, made up of coarse quartzose grains, with intercalations of finer-grained sandstone, occasionally beautifully ripple-marked. It corresponds in its lithological features with that forming the Ozark range of mountains.

In Sebastian county I found a few *Calamites*, *Lepidodendra*, and several varieties of fossil ferns of the coal formation, but organic remains are by no means abundant. Bituminous coal exists in almost inexhaustible quantities throughout the county. The seams vary in thickness from a few inches to seven feet, and they lie in such a manner that they can be wrought easily. Coal has also been discovered at a number of localities between Fort Smith and Fort Washita.

About a hundred miles southwest of Fort Smith we encountered an outcrop of bluish-gray limestone, which extends across the country in a southeasterly direction for the distance of about twenty miles; it presents an average thickness of about ten feet, with a dip to the east of 30°. Its precise character could not be determined, as we were unable to find any fossils.

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* Figures and descriptions of the fossils of these beds will be found in the appended report of Dr. B. F. Shumard on the palæontology of the expedition.

Pursuing the same direction, twenty-five miles beyond is an outburst of granite, which extends for the distance of twenty-six miles, with a southerly bearing. This is the only example of rocks of igneous origin to be met with between Forts Smith and Preston, and the rough and rugged features of the country where it prevails, forms a striking contrast with the comparatively rounded outline of sandstone hills. The rock is of a coarse texture, and varies in compactness in different portions of the range; feldspar of the flesh-colored varieties predominates over the other ingredients. In places the rocks would form an excellent and durable building material, but in other portions of the range it crumbles readily when exposed to the action of the weather.

We observed numerous veins of quartz traversing the granite in various directions, and, at some points, dykes of compact greenstone porphyry. Saline springs were found not unfrequently issuing from the base of the range, and the waters in one or two instances were found so strongly impregnated with saline matter, as to induce the belief that they might be worked with profit.

Passing this range, the sandstone again reappears, and constitutes the prevailing rock to within a short distance of Fort Washita, where it disappears, and is succeeded by strata of the cretaceous period.

From this point the cretaceous rocks were found to extend uninterruptedly until we reached the southwestern boundary of the Cross-Timbers, in Texas. From the best information I was able to procure, it constitutes the prevailing formation from Fort Washita in the direction of Fort Towson for upwards of a hundred miles, with an average breadth of fifty miles. It forms part of that extensive belt of cretaceous strata that extends from Georgia to Texas, and which, from the character of its fossil fauna, is now regarded as the equivalent of the upper chalk of England, and with that division of the cretaceous group to which D'Orbigny gives the name of *l'Etage Senonien*, (Prodrome de Palæontologie, tome II, page 669.) Wherever sections of the strata were to be seen they presented the following characters: grayish-yellow sandstone, with intercalations of blue, yellow, and ash-colored clays, and beds of white and bluish-white limestone. The limestone reposes on the clays and sandstones. At some points it attains the thickness of a hundred feet; while at others it is quite thin, and sometimes even entirely wanting. It is usually soft and friable, and liable to disintegrate rapidly when exposed to the action of the weather. These cretaceous rocks are often full of fossils. At Fort Washita the layers are crowded with *Ananchytes*, *Hemiaster*, *Nucleolites*, *Ammonites*, *Ostrea*, *Pecten*, &c., descriptions and figures of which will be found in Dr. B. F. Shumard's

report on the palæontology of the expedition. We saw here some specimens of ammonites several feet in diameter, and weighing between four and five hundred pounds. On Red river, twenty-six miles from Fort Washita, the sandstone of the cretaceous group supports about twenty-five feet of ash-colored calcareous loam, which, on inspection, was found to contain terrestrial and fluviatile shells of the genera *Lymnea*, *Physa*, *Planorbis*, *Pupa*, and *Helix*, the whole resembling species which we have observed in the loam at New Harmony, Indiana, and elsewhere in the Mississippi Valley, which Mr. Lyell, during his visit to this country, recognised as the equivalent of the loess of the Rhine.

The geological formation, as developed in the vicinity of Camp Belknap, consists of nearly horizontal strata of fine-grained sandstone, shale, and soft, drab-colored, non-fossiliferous limestone, whose relative positions correspond with strata of the same character largely developed between Fort Washita and Fort Smith. On the surface were in many places strewn fragments of a reddish-gray, igneous rock, containing a large per-centage of carbonate and oxide of iron. From the frequent indications of the presence of that metal in various localities of this region, it is not improbable that this may become hereafter an extensive and profitable field of mining enterprise. Recently a number of seams of bituminous coal, varying in thickness from two to four feet, as well as the characteristic fossil ferns of the carboniferous era, have been discovered.

The following section, taken about one mile from the post, may give a better idea of the formation:

1. Subsoil arenaceous, and of a red color; thickness from three to ten feet.
2. Black shale, soft, and rapidly disintegrating; four feet thick.
3. Seams of bituminous coal, from two to four feet thick.
4. Fine-grained sandstone, of a yellowish gray color, and containing fossil ferns; thickness variable.
5. Gray non-fossiliferous limestone; thickness unknown.

The water obtained from springs in this vicinity frequently contains iron in solution. I have been informed that in a few instances chloride of sodium has been detected in it.

May 3.—Formation the same as at Camp Belknap. Observed, strewn over the surface, large quantities of iron-stone; soil and subsoil arenaceous, and deeply tinged with oxide of iron.

May 4.—Saw a number of horizontal layers of coarsely laminated sandstone; between the laminations were observed a large number of ripple-marks. Soil good, and of a dark color; subsoil, in some places, arenaceous, in others argillaceous, and of a deep-red color.

May 5.—For the first six miles the surface became gradually more elevated. Here, and elsewhere to-day, we met with a number of horizontal layers of coarse-grained and highly ferruginous sandstone, which was more or less laminated, and highly embossed with ripple-marks. In many places we met with extensive deposites of porous and dark-colored igneous rock, containing a large per-centage of oxide of iron. The surface was everywhere strewn with drift, mostly composed of quartz, greenstone porphyry, and granite. Saw a number of conical hills, varying in height from ten to seventy-five feet, and composed of horizontal layers of sandstone, of the same character as that first met with to-day. Owing to the rapid disintegration of the sandstone, the hills are gradually crumbling away. In many places we found a few loose fragments of sandstone, intermixed with sand, the only indication left of the previous existence of many of them. In this manner has a levelling process gone on for ages, which, if not interfered with, will ultimately tend to the removal of the various inequalities of the surface of the prairies. Soil good; subsoil argillaceous, and of a deep-red color: this mixing in the form of sediment with the water, imparts to it a red color and disagreeable taste. From the north branch of the Witchita I collected a number of bivalve shells of the genus *Unio*.

May 6.—Sandstone and drift the same as yesterday. Saw a number of bluff banks, varying in height from ten to fifty feet. They were composed of red loam, the relative position of which was found to be below that of the sandstone. Soil and subsoil the same as we passed yesterday.

May 7.—Formation the same. Drift appears to be gradually becoming more abundant.

May 8.—During the day we had frequent opportunities of observing the sandstone and red loam. Their relative positions were the same as before, and dipped in various directions at angles of from one to three degrees. Saw a number of small boulders, composed of granite and greenstone porphyry.

May 9.—Did not move from camp. In the afternoon I explored a few miles along the banks of the Big Witchita. The geological formation, as there developed, consisted of finely laminated, soft, ferruginous sandstone, interstratified with red clay, together with drift, which last was much coarser than any previously observed. Soil good; subsoil loamy.

May 11.—Formation the same as before. Found a number of specimens of peroxide of iron.

May 12.—Red river, as observed to-day, runs through a thick bed of red loam, which, mixing with the water, imparts to it highly characteristic red sedimentary properties. Its bed was composed of fine sand. After travelling about six miles we came to a small creek with high bluff banks, near the base of which I observed a number of specimens of green and blue copper ores. Associated with it, as a matrix, was a porous and dark-colored igneous rock, containing disseminated particles of green copper ore. At this point I had an opportunity of observing the aqueous strata, from which I obtained the following section:

1. Black argillaceous subsoil; six feet thick.
2. Soft fine-grained sandstone, of a grayish color; five feet thick.
3. Red and blue clay; from six to ten feet thick.

These strata presented an easterly dip of nearly two degrees. I saw during the day large quantities of drift and a few small boulders, composed of granite, quartz, and greenstone porphyry. In a few hours we arrived at Cache creek, which runs between high bluff banks composed of red clay; its bottom was thickly strewn with large, angular fragments of quartz, greenstone porphyry, granite, and hornblende rock. Within a short distance from the creek we found a small spring of clear water, which was strongly impregnated with sulphuretted hydrogen gas. Soil dark and fertile; subsoil argillaceous, and of a deep-red color.

May 14.—Did not move from camp. In the evening I rode to the junction of Cache creek and Red river, near which point I observed a stratum of finely laminated ferruginous sandstone; in some places it was interstratified with red clay, and presented a south-southeasterly dip of three degrees, (see Section No. 3.) Saw scattered over the surface a number of small boulders of the same composition as those of yesterday. Soil black and fertile; subsoil argillaceous.

May 15.—Did not move from camp; tested the water of Cache creek, and found it strongly alkaline. Its temperature was 75° F.

May 16.—Passed to-day a number of long, low ridges, presenting on one side a gradual slope towards the prairie-level; on the other, abrupt precipitous terminations. They were for the most part composed of dark-colored scoriaceous rock, containing a moderate per-centage of copper ore. About 8 o'clock we came to a small creek, near which I observed a deposite of soft granite, which appeared to be undergoing rapid disintegration. The banks of the creek were composed of horizontal layers of finely laminated sandstone, deeply tinged with copper, and resting upon a base of red indurated clay. Saw to-day large quantities

of drift, containing small boulders, composed, as before, of greenstone porphyry, quartz, and granite; soil and subsoil arenaceous.

May 17.—Formation the same as on yesterday; saw strewn over the surface a large quantity of reddish-brown and black calcareous rock, containing carbonate of copper and small crystals of calcareous spar. From the drift (which appears to be becoming more abundant and its particles less rounded) I obtained specimens of chalcedony, jasper, and carnelian. Soil and subsoil arenaceous, and of a reddish color.

May 18.—Saw a number of deposites of soft, coarse granite, which appeared to be undergoing rapid disintegration. The surface presented large quantities of dark-colored and cellular igneous rock, composed principally of silex and carbonate of lime; soil and subsoil arenaceous.

May 20.—Observed several clear springs bubbling up from beneath the surface. Formation the same as before; soil and subsoil arenaceous.

May 21.—Met to-day with several sections of finely laminated sandstone of the same character as that before mentioned, with the exception that the different laminæ were thickly marked with small circular spots of a green and yellow color. In several places I found it interstratified with red clay. Near our encampment a fine section, showing an anticlinal axis, the strata dipping east and west at an angle of three degrees, exposed itself; over the surface were strewn large quantities of dark-colored igneous rock of the same character as that seen on the 18th instant. The drift was less abundant than before; soil and subsoil arenaceous.

May 22.—The surface was strewn in many places with detritus composed of greenstone porphyry and granite; soil and subsoil arenaceous.

May 23.—Did not move from camp; in the evening I explored Otter creek, which at this point runs between bluff banks composed of red clay. Its bed was thickly covered with drift, from which I obtained a number of agates and two small specimens of bluish-yellow quartz, each containing a small particle of gold. By digging a few inches below the drift, I reached a deposite of black ferruginous sand, which, upon being stirred, emitted a strong odor of sulphuretted hydrogen gas. From the creek I obtained a number of univalve and bivalve shells; the latter principally of the genus *Unio*.

Captain Marcy having to-day visited several of the mountains, presented me with a number of specimens of soft granite of a reddish-brown color, and of which the mountains appeared to be composed.

May 25.—Remained in camp. This afternoon I measured with a thermometer the temperature of Otter creek, and found it to be 72° F.

Immediately adjoining the creek the soil is good and very productive; but at a little distance from it, it is barren and sandy.

May 26.—To-day we passed a number of sand-hills, varying in height from ten to thirty feet. The only rocks met with were a few small boulders, composed of quartz and greenstone.

May 27.—The surface was in many places composed of detritus of granite, quartz, and greenstone; saw to-day a number of boulders, mostly composed of hard granite, and presenting smooth and polished surfaces. The largest was about fifteen feet in circumference, and would weigh probably three or four thousand pounds. We frequently encountered local deposites of red scoriaceous rock. Captain McClellan having visited one of the mountains, presented me with a specimen of gray calcareous sandstone, which, as he informed me, he obtained from a horizontal stratum of the same, situated within a few feet of the base of the mountain.

Thus far about twelve of the Witchita mountains have been examined, and have been found to present a nearly uniform appearance and structure. Composed of fine granite of various degrees of hardness and color, they rise abruptly from a smooth and nearly level plain to the height of eight or nine hundred feet. Many of them are isolated and of an irregular conical shape, while others are grouped together in small clusters, and are more or less rounded. At a distance they appeared to be smooth, but upon a nearer approach their surfaces were found to be quite rough, and presenting the appearance of loose rock thrown confusedly together. In many places the granite was observed occupying its original position, and was variously traversed by joints and master-joints, which, intersecting each other at right-angles, gave to the mass somewhat of a cuboidal structure. Soil rich, and from three to four feet thick; subsoil argillaceous and of a red color.

May 28.—Did not move from camp. In the evening I explored a short distance up and down Otter creek; its bed is here composed of horizontal layers of finely laminated sandstone, containing green and yellow spots of the same character as those noticed on the 21st instant.

May 29.—Passed a number of the mountains, several of which I ascended and found composed of hard granite, variously traversed by veins of greenstone porphyry and yellow quartz; the last containing small scales of mica. The sides of the mountains frequently presented lofty precipices, one of which was divided from top to bottom by a vein of greenstone nearly perpendicular, and about twenty inches thick. I observed no change in the character of the adjoining prairie, except a few local deposites of drift and detritus, from which I collected specimens

of chalcedony, agate, and jasper. No rock of any description was observed at a greater distance than a few feet from the base of the mountains. Soil thick and fertile; subsoil loamy.

May 30.—The mountains did not differ materially in appearance or structure from those before observed; at a distance, a few of them appeared to present a columnar structure, but upon a nearer approach this was found to be owing to divisional plains, or master-joints, with weather-worn and rounded edges. I observed to-day a number of clear springs; the water of several being tasted, was found to be alkaline.

In the prairie we observed several circular elevations, varying from one hundred to one hundred and thirty yards in diameter, and ascending in some places to the height of three or four hundred feet above the general level. Upon examination, their mineralogical composition was found to be the same as that of the neighboring mountains. Within a few feet of one of these, a small ravine exposed to view a horizontal stratum of soft ferruginous sandstone. Soil and subsoil the same as on yesterday.

May 31.—The mountains presented the same general appearance as on yesterday. From their surface were exhibited a large number of veins, varying in thickness from an inch to a foot and a half, and composed of greenstone, quartz, and hornblende. The prairie was here and there dotted with a number of conoidal elevations, varying in height from twenty to one hundred feet. In composition they agreed in every respect with the neighboring mountains, with which in origin they appeared to be cotemporaneous. From the drift I collected specimens of fossil-wood. The water of springs issuing from the mountains I found, upon test, to be alkaline.

June 1.—Red river as observed to-day runs between low bluff banks, composed of red clay. Its bed was in some places thickly strewn with large detached masses of granite, all presenting a highly water-worn appearance, and seeming to have been derived from a neighboring mountain. Soil and subsoil the same as before.

June 2.—Immediately upon leaving the Witchita mountains, we lost all traces of drift and other igneous rocks. Red river as observed to-day runs between high bluff banks, composed of horizontal layers of red, yellow, and blue clay, and finely laminated sandstone; the latter being interstratified with thin seams of saccharoid gypsum, (see Section No. 4.) About a mile from the river, we observed two conical hills—one fifty and the other eighty feet in height—composed of horizontal layers of sandstone, interstratified with thin seams of gypsum. From them I obtained specimens of selenite. Soil and subsoil loamy.

June 3.—To-day we came to a range of high bluffs about six miles in length, and extending in a direction nearly parallel with the river. At a distance they resembled a long line of fortification; upon examination they were found to be composed of horizontal layers of red and blue clay, thickly interstratified with snow-white gypsum, (see Section No. 5.) These bluffs appeared to be rapidly yielding to the weather: along their base were thickly strewn large cuboidal masses of gypsum—some ten feet in diameter—that appeared to have been but recently detached from a stratum of the same near their summits. In the blue clay I observed a thin seam of carbonate of copper. The gypsum was also in a few places slightly tinged with the same metal. In a southerly direction, and at the distance of about fifteen miles, we observed another range of gypsum bluffs: they appeared to run in a direction parallel with those already described. The intervening country was very rough and broken. Soil dark and fertile; subsoil argillaceous.

June 4.—Passed a number of bluffs of the same composition as those observed yesterday. The surface during the greater portion of the march was whitened by gypsum, which was always found occupying its position above the red clay. In the evening I visited a small hill, situated about three miles from camp, and succeeded in discovering a thin seam of copper ore, as well as large beds of selenite. Soil and subsoil the same as on yesterday.

June 5.—The country travelled over to-day was mostly composed of sand-hills, varying in height from ten to sixty feet. On the middle branch of Red river we saw long ranges of bluffs, which, upon examination, proved to be of the same character and composition as those seen on the 3d instant. Soil and subsoil arenaceous.

June 6.—To-day we passed a number of bluffs composed of red clay; I did not observe any gypsum in their composition. As we progressed, the country gradually became more elevated. Here, for the first time since leaving the Witchita mountains, we met with large quantities of drift, composed principally of quartz and mica-schist. On Red river we saw a fine section, fully exposed, showing a horizontal sub-stratum of coarse-grained sandstone, overlaid by drift; the latter forty feet thick.

June 7.—Formation the same as on yesterday.

June 8.—Passed a number of ravines, the sides of most of which were composed of red clay. At about 8 o'clock we came to a small eminence in the prairie, near which I observed an outcrop of grayish-yellow sandstone, presenting a dip of forty degrees to the west. The surface was thickly covered with drift. I saw a number of boulders composed of coarse and fine conglomerate, the largest of which meas-

ured fifteen feet in diameter. At 9 o'clock we came to a small creek, with high banks composed of gray calcareous loam, from which latter I obtained a number of shells, characteristic of the loess formation: *Helix plebeium*, *Succinea elongata*, &c. Soil barren and sandy; subsoil in some places argillaceous, in others arenaceous.

June 9.—Passed to-day a number of small ravines, the sides of which were composed of red clay, overlaid by sandstone and drift. The surface was in many places covered with sand-hills, varying from ten to fifty feet in height. About 8 o'clock we came to an outcrop of finely laminated red ferruginous sandstone, presenting an irregular dip to the northeast of about thirty degrees, (see Section No. 4.) Soil arenaceous; subsoil in many places argillaceous.

June 10.—Formation the same as on yesterday. We frequently found the sandstone exposed and exhibiting evidences of violent disturbance, the strata being variously fractured, and in some places upheaved in such a manner as to stand almost perpendicular. With the exception of the creek bottoms, the soil was sandy and barren; subsoil the same as before.

June 11.—The surface to-day presented nothing but a succession of hills composed of blown sand, varying in height from ten to one hundred feet. No sandstone or drift was anywhere observed.

June 12.—To-day I observed large quantities of drift, of the same composition as before; through it were scattered small boulders, composed of quartz and mica-schist. The surface was in many places covered with loose fragments of carbonate of lime. The particles composing the drift were frequently thickly coated with the same substance. Soil and subsoil arenaceous.

June 13.—Did not leave camp.

June 14.—Drift and limestone the same as before. About 7 o'clock we came to a small ravine, the sides of which exposed a horizontal stratum of coarse-grained sandstone twenty feet thick. From the drift I obtained specimens of agates, chalcedony, and fossil-wood. Soil and subsoil the same as before.

June 15.—The country travelled over to-day was everywhere divided by ridges and ravines; the former sometimes sloping gradually on either side—at others presenting abrupt precipitous terminations. Besides these, a large number of sand-hills, varying in height from twenty to one hundred feet, were observed. The sandstone was frequently exposed. In a few places I found it interstratified with coarse conglomerate; saw a number of small boulders, composed mostly of greenstone, greenstone porphyry, and trachyte. In the bed of the river I found a large mass

of black scoriae and several other specimens of volcanic rocks. Drift the same as on yesterday; soil and subsoil arenaceous.

June 16.—The surface was broken, and presented a number of sand-hills. Saw to-day large quantities of drift, which did not differ in composition from that previously noticed. At about eight o'clock we came to a long range of high bluffs, which, as we afterwards ascertained, marked the borders of the "Llano estacado." They were composed of horizontal layers of drift, sandstone, and yellow clay, (see Section No. 7,) all of which seemed to be rapidly yielding to the weather. At the base of the bluffs I observed a few small boulders composed of greenstone porphyry. Soil and subsoil sandy.

June 20.—During the first part of our route we travelled over a hilly and broken region, consisting for the most part of a succession of sand-hills, varying from ten to one hundred feet in height. At the distance of five miles we reached a gradual ascent, which soon led us to the summit of a high and slightly-rolling plain: over its surface were scattered a great many fragments of white carbonate of lime, as well as drift. From the latter I obtained specimens of agate, chalcedony, &c. During the day I had frequent opportunities of observing the formation, which uniformly consisted of drift, interstratified with horizontal layers of red and yellow clay. Sometimes the drift exhibited a calcareous coating, the same as before described.

June 21.—Passed to-day a number of drift-hills, varying in height from twenty to one hundred feet. The surface was very much divided by ravines, with perpendicular sides, composed mostly of red clay, and varying in depth from ten to fifty feet. Near our encampment I observed a horizontal section of yellow loam, coarse conglomerate, and red clay; the last thickly reticulated with gypsum, and overlaid by a terminating stratum of the same, (see Section No. 8.) Soil and subsoil arenaceous.

June 22.—Passed a large number of drift-hills. The country, as on yesterday, was very rough, and much divided by ravines, some of which were fifty feet deep. Their sides were generally composed of red clay, overlaid by drift; in a few instances they exposed seams of gypsum. From the drift I obtained specimens of fossil-wood, agate, jasper, and a few water-worn fossil shells of the genus *Ostrea*. Soil and subsoil the same as before.

June 23.—To-day we observed the gypsum frequently exposed. It did not differ in character from that previously described, and was always found overlying the red clay. Soil and subsoil arenaceous.

June 24.—The surface was in many places thickly strewn with loose fragments of white carbonate of lime. About seven o'clock we reached, after a gradual ascent, a high, level, and very fertile plain, from which we obtained an extensive view of the surrounding country, which was very hilly and divided by numerous ravines. The plain at its termination presented a long line of high bluffs, composed of horizontal strata of drift, finely laminated sandstone, white limestone, conglomerate, gypsum, and red and yellow clay, (see Section No. 9.) The red clay was thickly interstratified with thin seams of gypsum. From the drift I obtained specimens of agates, fossil-wood, jasper, and chalcedony. Soil and subsoil the same as before.

June 25.—The country travelled over to-day was very hilly and broken, being much divided by long, narrow ravines, with nearly perpendicular sides, composed of red clay—some of them being over one hundred feet deep. In many places we were surrounded by high bluffs. The drift was found to be unusually abundant—in some places fifty feet thick, and much coarser than before met with. At about eleven o'clock we came in sight of the valley of the Dogtown river. On either side it was bounded by long lines of bluffs, in composition similar to those previously noticed, and varying in height from one hundred to one hundred and fifty feet. From the drift was obtained specimens of chalcedony, agates, silicified wood, and jasper, besides a large number of shells of the same character as those observed on the 22d instant. The beds of the different streams crossed were covered with black ferruginous sand. Soil good, consisting of a rich black mould; subsoil argillaceous.

June 26.—For the first few miles the country was hilly and very much divided by ravines, some of which were two hundred feet in depth. The strata exposed by them were invariably found to consist of horizontal layers of red clay, gypsum, and drift, each occupying the same relative position as shown in Section No. 9.

June 27.—Formation the same as on yesterday. At ten o'clock we came to Dogtown river, the bed of which was composed of yellow sand, intermixed in some places with red clay, and covered with small shining particles of gypsum. I observed in the drift large quantities of red and yellow jasper. Soil fertile; subsoil argillaceous.

June 28.—Saw a large number of drift-hills, varying in height from fifty to one hundred and fifty feet. After travelling a few miles we again came to the borders of the "Llano estacado," which here presented a long line of bluffs six hundred feet high, and composed of horizontal layers of drift and sandstone, interstratified with white limestone. From

the base of the bluffs to the river, the country presented a gradual slope of four hundred feet.

Section No. 10 is intended to represent the geological formation from the river level to the summit of the bluffs; the inferior strata, or those between the base of the bluffs and the river, having been ascertained, from numerous observations, to consist of gypsum and red clay. From the drift I obtained specimens of chalcedony, jasper, granite, and obsidian.

July 4.—The formation as observed to-day consisted of red clay, gypsum, and drift: they were all found occupying the same relative positions as before. Soil mostly fertile; subsoil argillaceous.

July 5.—Observed in the prairie a circular outcrop of finely laminated calcareous sandstone about three hundred feet in diameter, and presenting a quaquaversal dip of forty degrees. Over the prairie were strewn a number of small boulders, variously composed of mica-schist, greenstone, and quartz. Red clay, gypsum, and drift, the same as before. Soil and subsoil arenaceous.

July 6.—Observed a number of hills, varying in height from fifty to one hundred feet; in form they resembled truncated cones, and were composed of horizontal layers of sandstone and red clay. General formation the same as before. Soil in some places fertile; subsoil argillaceous.

July 7.—With the exception of the drift, which appears to be rapidly diminishing in thickness, the formation did not differ from that previously observed. The surface was everywhere whitened with beds of gypsum and loose fragments of carbonate of lime. The former varied in thickness from five to fifteen feet; in it were observed large quantities of selenite.

July 8.—The formation was mostly composed of red clay, with a few local deposites of soft carbonate of lime and dark-colored cellular sandstone. Saw no drift or gypsum to-day. Soil fertile; subsoil argillaceous.

July 9.—Again came in sight of the Witchita mountains: the one nearest to us presented the form of a truncated cone, with an irregular basin-shaped depression upon the summit. The formation everywhere consisted of red clay; in a few places it was overlaid by thin seams of gypsum containing selenite. I observed a number of local deposites of white carbonate of lime. Like the gypsum, it was found overlying the red clay. On our route we passed four conical hills from fifty to seventy feet high, and composed of red clay, interstratified with dark-

colored porous sandstone. Observed no drift to-day. Soil dark, and fertile; subsoil argillaceous.

July 10.—Formation the same as on yesterday. Soil dark and fertile; subsoil argillaceous.

July 11.—Formation the same as before.

July 12.—To-day we met with no gypsum. At about 9 o'clock we came to Otter creek; its bed is here, as well as elsewhere, composed of finely laminated sandstone, containing small circular spots of a greenish color. In many places this was covered to the depth of a few inches with drift and detritus. Soil fertile; subsoil argillaceous.

July 14.—Renewed the observations of May 23d, 24th, 25th, 26th, and 27th.

July 15.—To-day we passed a number of the Witchita mountains, but observed neither in their composition nor general appearance anything different from what had been previously noticed. Near the base of one of them I observed a nearly horizontal stratum of sandstone, underlaid by red clay. The ground was in several places covered with loose fragments of gypsum, some of which were found to contain slight traces of copper. In one of the creeks I observed a small deposite of black ferruginous sand. Soil black and fertile; subsoil argillaceous.

July 16.—The only difference presented by the mountains seen to-day, from those previously observed, consisted in the greater number and size of the quartz veins: many of them were nearly perpendicular, and extended from near the base of the mountains to their summits; while others, pursuing a more or less serpentine course, frequently intersected each other at right-angles. The largest was highly ferruginous, presented a more or less cellular structure, and was nearly three feet wide. A few feet from the base of one of the mountains I observed a horizontal stratum of coarsely laminated sandstone, of a yellowish color, and including in its composition small angular fragments of granite of the same character as that of the neighboring mountains. To-day I examined several of the head branches of Cache creek. Their beds were thickly strewn with large angular fragments of quartz, greenstone, and porphyry. In each of them I observed large quantities of black ferruginous sand. Soil fertile; subsoil argillaceous.

July 17.—In a number of places the sandstone was exposed; it did not differ in character and composition from that seen the day before. In one place the strata, still preserving their horizontal character, presented abruptly to the side of a mountain. Many of the mountains presented a marked difference in character and composition from any that had been previously observed: instead of displaying a rough and

broken exterior, they were more or less rounded, and exhibited a gradual slope to the prairie-level, while the granitic structure almost entirely disappeared, its place being occupied by that of fine porphyry of a reddish color. Scattered over the prairie were observed a great many fragments of granite, greenstone porphyry, and quartz. The beds of the different creeks were in many places covered with black ferruginous sand, as well as large fragments of quartz, porphyry, and hornblende. Soil black and very fertile; subsoil argillaceous.

July 18.—The mountains presented the same appearance and structure as on yesterday. At about 8 o'clock we arrived at Cache creek; its bed was thickly strewn with black ferruginous sand and large fragments of igneous rock. From the water's edge rose abruptly a long line of smooth perpendicular cliffs, varying in height from three to four hundred feet, and having in some places a slight columnar structure, (see Section No. 11.) Upon examination they were found to be composed mostly of fine porphyry of a reddish color, which was traversed by parallel and nearly perpendicular veins of cellular quartz, varying in thickness from two to three feet. Upon its exterior the quartz presented a deep iron-rust color; but when recently fractured, it exhibited various shades of gray and brown, together with small shining particles of sulphuret of iron. Soil fertile, and in some places three feet thick; subsoil argillaceous.

July 19.—I spent the greater part of the day in exploring Cache creek. About one mile below our present encampment I came to the termination of the cliffs. A short distance below this I observed a nearly horizontal stratum of coarsely laminated sandstone, fifty feet thick, and including in its composition fragments of igneous rock of the same character as that composing the cliffs; the intermediate space being occupied by red clay, which, as before, appeared to underlie the sandstone, (see Section No. 11.)

July 20.—Two miles below our camp of last evening I observed a section composed of horizontal layers of gray sandstone, containing in its composition small fragments of igneous rock. Six miles from this we struck a seam of gypsum, varying in thickness from six to twelve inches. Soil fertile; subsoil composed of red and yellow clay.

July 21.—During the day we met with frequent exposures of the sandstone and gypsum. They presented, however, nothing different from what has already been described. Soil and subsoil the same as on yesterday.

July 22.—Formation the same as on yesterday.

July 23.—Did not move from camp.

July 24.—The sandstone appears to be gradually becoming more abundant, while the red clay is less frequently observed than before. Saw no gypsum to-day. Soil fertile, and in some places six feet deep; subsoil composed of yellow clay.

July 25.—Passed a number of small conical hills composed of red clay, overlaid by sandstone. The latter was highly ferruginous, and contained nodular concretions of iron. Soil and subsoil the same as on yesterday.

July 26.—Formation the same as before.

July 27.—At about eight o'clock we came to an extensive outcrop of bluish-gray, non-fossiliferous limestone, which presented in many places a highly crystalline structure. Its relative position was found to be below that of the sandstone. Passed a number of hills, varying in height from one to two hundred feet, and composed of limestone, overlaid by finely laminated sandstone. Soil fertile; subsoil the same as before.

July 28.—To-day the sandstone disappeared almost entirely, its place being occupied by limestone of nearly the same character as that encountered yesterday. Soil and subsoil the same as before.

July 29.—Remained in camp.

July 30.—To-day we again observed the limestone in great abundance. It presented nothing different in character from that previously described. The sandstone and red clay were also in many places largely developed. Soil very fertile; subsoil the same as before. Started from camp at four o'clock in the afternoon. For the first few miles we found the sandstone largely developed; after passing which, we came to an outcrop of limestone of the same character as that previously noticed. It presented itself even with the surface at an angle of thirty degrees, and was over a mile wide. Immediately beyond this we came to a deposite of coarse granite of a reddish color, and variously traversed by veins of quartz. This remarkable formation (as I have been informed) extends about twenty-six miles in an easterly and westerly direction, and is nearly six miles broad. Throughout its entire extent it is said to present the same character, and is everywhere surrounded by aqueous strata. I observed to-day in one of the creeks several boulders, composed of milky quartz; the largest was four feet in diameter. Soil and subsoil the same as before described.

July 31.—Shortly after starting this morning we again struck the limestone formation, which continued to be largely developed during the remainder of the distance to Fort Washita. In it I observed a large number of the characteristic fossils of the cretaceous period.

APPENDIX E.

PALÆONTOLOGY.

DESCRIPTION OF THE SPECIES OF CARBONIFEROUS AND CRETACEOUS FOSSILS COLLECTED: BY B. F. SHUMARD, M. D.

APPENDIX E.

PALÆONTOLOGY.

BY B. F. SHUMARD, M. D.

FOSSILS OF THE CARBONIFEROUS SYSTEM.

CRINOIDEA.

CYATHOCRINUS GRANULIFERUS, Yandell and Shum., mss.

PALÆONTOLOGY, Pl. —, fig. —.

The collection contains a single pentagonal plate of this beautiful encrinite, a perfect specimen of which we found several years since, in the superior carboniferous strata near the summit of Muldrow's Hill, in Kentucky. The costal plate from Arkansas exhibits granules regularly dispersed in rows over the surface, which radiate from the centre to the sides of the pentagon.

It occurs in Washington county, Arkansas, in grayish earthy limestone, associated with *Productus punctatus*, *Terebratula subtilita*, and *Spirifer striatus*.

AGASSIZOCRINUS DACTYLIFORMIS, Troost, mss.

PALÆONTOLOGY, Pl. 1, fig. 7.

Cup conical, composed of three series of pieces; plates massive, smooth, moderately convex; column none; pelvis composed of five pieces, quadrangular, greatest width near the upper edges; second series of pieces five, pentagonal, length and breadth about equal; length of pelvis three lines, greatest width five lines; length and breadth of second series of pieces about three lines.

We regret that the specimens of this crinoid from Arkansas are all imperfect, consisting only of detached portions of the cup. It is a fossil peculiar to the western and southwestern States, and eminently characteristic of the superior members of the carboniferous strata, occurring in some localities very abundantly. The genus is remarkable, from the fact of its being destitute of a column, in which respect it differs from all known carboniferous crinoids. In young individuals, the division of the pelvis into five pieces is well marked; but in adult age they are usually firmly anchylosed, and often all traces of sutures are obliterated. In the centre of the pelvis we observe a small cylindrical tube running nearly its whole length, closed below, but communicating above with the cavity of the cup by a small opening. This structure, probably the nucleus of a column, is only visible when the plates are separated.

It is associated with the preceding species, in the carboniferous beds of Washington county, Arkansas.

Pentremites florealis, Say.

Pentremites florealis, Say, 1820, Jour. Acad. Nat. Sciences, IV, 295, *Pentatrematites florealis*, Roemer, 1852, Monog. Blastoid. p. 33, taf. i. fig. 1—4, taf. ii, fig. 8.

This well-known species is quite common in Washington and Crawford counties, Arkansas. The specimens furnished by my brother are rather more globose than those from localities in Kentucky, Indiana, and Illinois.

Pentremites sulcatus, F. Roemer.

Pentatrematites sulcatus, F. Roemer, 1852, Monog. Blastoid. p. 34, taf. iii, fig. 10, a—c.—*Id.* Lethaea Geognostica, taf. iv, fig. 8, a, b.

We have some doubts as to whether this pentremite is entitled to rank as a distinct species, or whether it should be regarded as merely a variety of *P. florealis*, which varies considerably in different localities. The form under consideration has generally been referred to *P. globosus*, Say, by western geologists, from which, however, it is quite different. Mr. Say's description of *P. globosus* was drawn from a specimen which was brought from Bath, England.

It is associated with the preceding species in Washington county, Arkansas.

BRYOZOA.

Archimedipora archimedes, Lesueur.

Palæontology, Pl. 1, fig. 6.

Retepora archimedes, Lesueur, 1842, Amer. Jour. Science, XLIII, 19, fig. 2.

Archimedipora archimedes, D'Orbig. 1849, Prod. de Palæont. I, 102.

A fossil peculiar to the carboniferous strata of the western and south-western States. The associate fossils are *Pentremites florealis*, *Productus punctatus*, *Spirifer striatus*, and *Orthis Michelini*. D'Orbigny, in his Prodrome de Palæontologie, cites this fossil from rocks of the Devonian period, in Kentucky. This is an error; we believe it has not been found lower in the series than the encrinital limestones which repose on the fine-grained micaceous sandstones of the knobs of Kentucky and Tennessee.

It occurs in dark-grayish carboniferous limestone, in Washington county, Arkansas.

BRACHIOPODA.

Productus punctatus, Martin.*

Palæontology, Pl. 1, fig. 5, and Pl. 2, fig. 1.

This *Productus* has a wide geographical, as well as vertical, range in the United States; it is also widely distributed throughout Europe. In this country we find it commencing with the earliest carboniferous deposites, and extending through all the limestones of this system to the coal measures.

Figure 1 of plate 2 represents the ventral valve of a specimen from Washington county, Arkansas; and figure 5 of plate 2, an individual showing the hinge line and the form of the beak.

* For synonyms and references, vide Koninck's Monog. du Genre Productus et Chonetes, p. 123.

PRODUCTUS CORA, D'Orbig.

Prod. cora, D'Orbig., 1842, Palæont. Voy. dans l'Amer. Merid., p. 55, pl. 5, fig. 8, 9, 10.

P. tenuistriatus, Verneuil, 1845, Geol. Russ. et Ural., vol. 2, p. 260, pl. 16, fig. 6.

P. cora, Koninck, 1847, Monog. du Genre Prod. et Chonetes, p. 50, pl. iv, a, b, et pl. v, fig. 2, a—d.

The specimens from Arkansas are all imperfect, yet they are plainly referable to this species. It is one of the most characteristic fossils of the carboniferous beds of Kentucky, Indiana, Illinois, and Missouri. It occurs in Washington and Crawford counties, in gray sub-crystalline limestone.

PRODUCTUS COSTATUS, Sowerby.*

PALÆONTOLOGY, Pl. 1, fig. 2.

This *Productus* occurs with the preceding species, in Washington county, Arkansas, and, like it, has a very extended geographical range in this country and Europe.

TEREBRATULA SUBTILITA, Hall.

PALÆONTOLOGY, Pl. 4, fig. 8.

Terebratula subtilita, Hall, Stansbury's Expedition to Great Salt Lake, 409, pl. xi, fig. 1, a—b, 2, a—c.

This shell is very common in the superior members of the carboniferous formation in Illinois, Indiana, and Kentucky, where it usually is found with *Archimedipora archimedes*, *Pentremites florealis*, and *Productus punctatus*. Its vertical range being rather limited, it constitutes one of our most useful guides in studying the relative position of the various members of the carboniferous strata. This shell is very variable in its characters, so that we are liable to multiply species from its varieties, unless a number of specimens are under examination. Some individuals are very much inflated; the dorsal valve exhibits a profound

* For synonyms and references see Koninck's Monog. du Gen. Prod. et Chonetes, p. 92.

sinus, and the ventral valve a correspondingly elevated ridge. Others are depressed, with scarcely any sinus or bourrelet. The specimens I have seen from Arkansas are considerably mutilated. Occurs in Washington county.

Terebratula marcyi, Shumard.

Palæontology, Pl. 1, fig. 4, a, b.

Shell small, ovate, elongate, moderately convex, sides and front neatly rounded; dorsal valve regularly convex, rather more gibbous than the opposite valve, greatest height near the beak, no traces of sinus; beak elongated, elevated incurved, no perforation visible in our specimens; ventral valve without median ridge, pointed at summit, cardinal border slightly sinuous. Surface of each valve marked with from thirty-four to thirty-eight simple rounded striæ, which commence at the beak and proceed to the lateral borders and front with division. In general form it resembles *T. serpentina* of Koninck, (Descr. des Animaux fossiles, 29, pl. xix, fig. 8, a—e,) but its smaller size and the lesser number of striæ will serve to distinguish it.

It occurs with *Terebratula subtilita* and *Productus punctatus* in Washington and Crawford counties, Arkansas, in dark-grayish carboniferous limestone. We have found the same species in Floyd county, Indiana.

Spirifer, (indet.)

Palæontology, Pl. 1, fig. 3.

In the collection from Washington county are several casts of a spirifer like that which we have figured. They are all too imperfect for description.

FOSSILS OF THE CRETACEOUS PERIOD.

MOLLUSCA.

PECTEN QUADRICOSTATUS, Sowerby.

PALÆONTOLOGY, Pl. 3, fig. 6, and Pl. —, fig —.

Janira quadricostata, D'Orbig. Pal. Franç., III, 644, pl. cccexlvii, fig. 1—7.

Pecten quadricostatus, F. Roemer, Kreid. Texas, 64, taf. viii, fig. 4, a—c.

Shell sub-ovate, angulated, convexo-concave. Inferior valve convex, with prominent rounded radiating ribs, crossed by five concentric thread-like striæ. Ribs from fifteen to seventeen, of which five are more prominent than the others; smaller ribs disposed in pairs in the intervals between the larger ones. Superior valve slightly concave, with radiating unequal ribs.

As we have not been able to consult Sowerby's description of *Pecten quadricostatus*, we refer our fossil to this species on the authority of Dr. F. Roemer, whose figures and descriptions of specimens from Fredericksburg, Texas, correspond very accurately with those we figure from Fort Washita.

Figure 6 of plate 3 represents the inferior valve of a large individual from Fort Washita, and fig. — of plate — the superior valve of a smaller specimen.

EXOGYRA PONDEROSA, Roemer.

Exogyra ponderosa, F. Roemer, 1849, Texas, 394.

Ostrea ponderosa, D'Orbig., 1850, Prod. de Palæont., II, 256.

Exogyra ponderosa, F. Roemer, Kreid. Texas, 71, taf. ix, fig. 2, a—b.

Shell thick, ovate, sub-cuneiform; large valve gibbous, obtusely carinated, surface marked with imbricating lamellæ; small valve rather thin, sub-concave, surface uneven, concentrically laminated. Occurs rather abundantly at Fort Washita, generally in a fine state of preservation. Roemer cites this species from New Braunfels, Texas.

GRYPHÆA PITCHERI, Morton.

PALÆONTOLOGY, Pl. 6, fig. 5.

Gryphæa Pitcheri, Morton, Synops. Cretaceous Group, 55, pl. xv, fig. 9.
Ostrea vesicularis, D'Orbig. Prod. de Palæont. II, 256, (*pars.*)
Gryphæa Pitcheri, Roemer, Kreid. Texas, 73, taf. ix, fig. 1, a—c.

Shell ovate, thick, gibbous, irregular; inferior valve boat-shaped, inflated, divided into two unequal lobes by a longitudinal furrow, which begins at the umbo and runs the whole length of the shell; umbo large, elongate, incurved and slightly compressed laterally. Superior valve irregular, sub-oval, nearly plane, marked with concentric imbricating lamellæ. Occurs in great numbers in the cretaceous clays at Fort Washita, and more sparingly at Cross-Timbers, Texas. Dr. Morton's specimens were obtained from the plains of Kiamesha, Arkansas, and Dr. F. Roemer found it quite common near New Braunfels, Texas.

EXOGYRA TEXANA, Roemer.

PALÆONTOLOGY, Pl. 5, fig. 1, a—b, and fig. 5.

Exogyra Texana, F. Roemer, Texas, 396.
Ostrea matheroniana, (*pars.*) D'Orbigny, Prod. de Palæont. II, 255.
Exogyra Boussingaultii, Conrad's Geolog. Report of Lynch's Expedition to Dead Sea, 213, pl. i, fig. 9, pl. ii, fig. 10 and 11.
Exogyra Texana, Roemer, Kreid. Texas, 69, taf. x, fig. 1, a—e.

The specimens of this shell in the collection were obtained by Dr. G. G. Shumard, at Camp No. 4, Cross-Timbers, Texas. They vary very much in their characters, scarcely any two examples being alike. In some the shell is quite thin, in others massive; some exhibit prominent rugose ribs, while in others the ribs are but slightly elevated and nodulose. According to Dr. Roemer, this *Exogyra* characterizes the cretaceous deposites near Fredericksburg and New Braunfels, Texas. Mr. Conrad figures a shell from Syria, which he refers to *Exogyra Boussingaultii*, D'Orbig., and which appears to be identical with the species under consideration.

OSTREA SUBOVATA, Shumard.

PALÆONTOLOGY, Pl. 5, fig. 2.

Sub-ovate, trigonal, elongate, massive; inferior valve irregularly convex, inflated, thick, umbo obtusely angulated, somewhat prominent;

ribs four or five, longitudinal, irregular, rounded, nodulose; surface marked with concentric imbricating lamellæ; superior valve rather thin, ovate, nearly plane, slightly convex near the beak, surface with four or five well marked longitudinal undulating sulci.

It occurs at Fort Washita with *Gryphæa Pitcheri* and *Ammonites vespertinus*. It appears to be quite rare, the specimen figured being the only one furnished by the expedition.

Inoceramus confertim-annulatus, Roemer.

Palæontology, Plate 6, fig. 2.

Inoceramus confertim-annulatus, F. Roemer, Texas, 402. Kreidebild. Texas, 59, taf. vii, fig. 4.

Shell ovate, depressed with close concentric undulating ribs; ribs prominent, rounded, regular, intervals about equal to width of ribs.

I refer this fossil to the above species with some hesitation, as all the specimens of the collection are either weather-worn or badly mutilated. Nevertheless, if not identical, ours is a closely allied species. Occurs rather abundantly at Camp No. 4, Cross-Timbers, Texas. Dr. F. Roemer's specimens are from the Guadalupe, near New Braunfels.

Trigonia crenulata, Lamarck.

Palæontology, Pl. 4, fig. 1.

Trigonia crenulata, Roemer, Kreidebild. Texas, 51, taf. vii, fig. 6.

Shell trigonal, thick, with from fourteen to fifteen oblique crenulated ribs in each valve; anterior side wide, rounded, inflated, posterior side produced, compressed; inferior margin rounded.

From Cross-Timbers, Texas. All the examples in the collection are internal casts. Roemer cites this species from New Braunfels.

Astarte washitensis, Shumard.

Palæontology, Pl. 3, fig. 3.

Shell ovate, trigonal, a little longer than wide, compressed, inequilateral, marked with fine concentric rounded striæ; buccal side shorter than the anal, excavated; basal margin rounded, truncated posteriorly, beaks slightly prominent, excavated.

The only specimen of this species collected by the expedition is rather too imperfect to permit us to make a satisfactory description. It was found in the cretaceous strata at Camp No. 4, Cross-Timbers, Texas.

Cardium multistriatum, Shumard.

Palæontology, Pl. 4, fig. 2.

Shell sub-rotund, inflated, length and breadth nearly equal, truncated posteriorly, basal and anterior margins rounded; surface of posterior sub-margin with from fourteen to fifteen regular radiating striæ; remainder of surface marked with fine, equal, rounded, close, concentric striæ. Beaks rather prominent.

This is a neat, pretty species; and it is to be regretted that the specimens collected were not in a better state of preservation. It was found at encampment No. 4, Cross-Timbers, Texas, where it is rather uncommon.

Panopæa texana, Shumard.

Palæontology, Pl. 6, fig. 1.

Shell oval, elongate, inflated anteriorly, compressed behind, beaks moderately prominent, basal edge rounded, buccal extremity wide, rounded; surface marked with irregular concentric slightly elevated ribs. Length about 2 5-10 inches, breadth 1 4-10 inch, thickness 1 1-0 inch.

The only specimen of this species brought home by the expedition is an imperfect cast.

Locality, encampment No. 4, Cross-Timbers, Texas.

Terebratula choctawensis, Shumard.

Palæontology, Pl. 2, fig. a, b.

Shell sub-globose, inflated, sub-pentagonal, front slightly truncated, surface minutely punctate, the puncti only visible when examined through a strong lens; dorsal valve most inflated; beak obtuse, recurved, pierced by an oval aperture; area distinct, forming a well defined obtuse angle; ventral valve moderately convex, sub-orbicular. Length 9 lines, width 8 lines, thickness 6½ lines.

It resembles *Terebratula wacoensis*, (F. Roemer, Kreidebild. Texas, 81, taf. vi, fig. 2, a–c,) but differs in the character of the surface, which in *T. Choctawensis* is thickly studded over with minute puncta. It is also a smaller species; the area is not so wide comparatively, and the front is not so broadly truncate.

This beautiful Terebratula was obtained from the cretaceous deposites near Fort Washita, where it is quite rare, a single specimen only having been found.

Globiconcha (Tylostoma) tumida, Shumard.

Palæontology, Pl. 5, fig. 3.

Shell ovate-globose, spire pyramidal, volutions about six, whorls moderately convex; width of body whorl equal to about one half the length of the shell. Length 1 7-10 inch, width 1 3-10 inch.

All the specimens we have seen are badly preserved internal casts. Occurs at Cross-Timbers, Texas, in cretaceous limestone.

Globiconcha (?) elevata, Shumard.

Palæontology, Pl. 4, fig. 4.

Shell ovate, spire produced, whorls six regularly convex, body whorl shorter than spire. Length 1 5-10 inch, breadth 1 inch.

This is likewise an internal cast. It occurs with the preceding species.

Eulima (?) subfusiformis, Shumard.

Palæontology, Pl. 4, fig. 3.

Shell subfusiform, elongate smooth, spire produced, regularly conical; whorls about six, broad, very sllghtly convex; suture rather shallow, linear, aperture simple, sub-ovate; body whorl obtusely angulated. Length 2 8-10 inches, width 1 1-10 inch.

The collection contains only a single specimen of the cast of this species, and that badly weather-worn. It was found at Camp No. 4, Cross-Timbers, Texas.

AMMONITES VESPERTINUS, Morton.

Ammonites vespertinus, Morton, Synopsis Cretaceous Group U. S., 40, pl. xvii, fig. 1. *Id.*, D'Orbigny, Prodrome de Palæont. II, 212.

Shell large, volutions about three; vertical section sub-quadrangular; ribs prominent, each garnished with three nodules, dorsal one most prominent; dorsal margin furnished with a prominent rounded carina.

This is the largest species of Ammonite that has hitherto been found in the United States. In the cretaceous strata near Fort Washita, specimens were found to measure nearly three feet in diameter, and estimated to weigh upwards of two hundred pounds. It is quite common. The fragment described by Dr. Morton was obtained from the plains of Kiamesha, Arkansas.

AMMONITES MARCIANA, Shumard.

PALÆONTOLOGY, Pl. 4, fig. 5.

Shell compressed, not carinated, with about twelve simple, prominent rounded ribs, which cross the dorsum and sides of the last volution obliquely, without interruption; dorsum convex, whorls compressed; surface smooth in the intervals between the ribs; aperture longitudinal, sub-oval.

Length of last whorl 11 lines, width of do. 4½ lines; width of umbilicus 3 lines.

The specimen figured is a cast, and the character of the lobes of the chambers cannot be made out.

Occurs in the cretaceous strata of Cross-Timbers, Texas.

AMMONITES ACUTO-CARINATUS, Shumard.

PALÆONTOLOGY, Pl. 1, fig. 3.

Shell much compressed, sharply carinated, ornamented with from 30 to 34 transverse ribs; ribs simple, distinctly elevated, flexuous commencing narrow at the umbilicus and widening to within a short distance of the dorsal border, where they are again somewhat contracted; dorsal carina prominent, sharp smooth, marked on each side by a shallow depression; aperture elongate-cordate, lateral septa trilobate.

Diameter 2 4-10 inches; thickness of last whorl near aperture 5-10 inch.

Occurs rather abundantly with the preceding species at Cross-Timbers, Texas.

AMMONITES—(*undetermined.*)

PALÆONTOLOGY, Pl. —, fig. —.

Several specimens of a small variety of ammonite, such as is represented in the figure, were found with the two last-described species, but they are too imperfect for satisfactory description.

ECHINODERMATA.

HEMIASTER ELEGANS, Shumard.

PALÆONTOLOGY, Pl. 2, fig. 4, a, b, c.

Shell ovate orbicular, moderately convex at summit, broadly emarginate anteriorly; anal extremity truncated almost vertically, very slightly excavated; ambulacra sub-petalloid, broad, situated in shallow depressions, antero-lateral areas widely divergent, extending to the margin of the test, postero-lateral areas much less divergent and short, peripetalous fasciole indistinct; mouth transverse reniform, not far from the anterior border, post oral tuberculated space lanceolate; anus oval longitudinal, sub-anal fasciole scarcely visible; surface of test covered with small spinigerous tubercles, with minute granulæ in the interspaces. The dimensions of the largest specimen that I have been permitted to examine are as follows: length, 2 7-10 inches; greatest width, 2 5-10 inches; height, 1 5-10 inch.

This exceedingly elegant species occurs in great numbers in the cretaceous strata at Fort Washita.

HOLASTER SIMPLEX, Shumard.

PALÆONTOLOGY, Pl. 3, fig. 2.

Shell ovate, sub-cordate, gibbous, regularly rounded superiorly, most prominent near apex, which is sub-central, declining at first gently towards the mouth, then abruptly, truncated posteriorly, with a thread-like carina leading from the apex to the anus; oral sinus shallow, rounded;

ambulacra flexuous, extending to the base, increasing gradually in width to the inferior margin; antero-lateral are aswidely divergent; postero-laterals separated by a moderate interval; mouth transverse, oval; anus oval, longitudinal sub-anal fasciole indistinct; surface of test sparingly studded with spinigerous tubercles, with numerous microscopic granules in the interspaces. It approaches *Holaster* (*Ananchytes*) *fimbriatus*, Morton, (Silliman's Journal, XVIII, 245, pl. 3, fig. 9.) Our specimens, however, differ from the figures given by Dr. Morton in being less orbicular in the oral sinus, which is not so profound, and in the anal border, which is more widely truncated

Occurs with *Hemiaster elegans* at Fort Washita.

Holectypus planatus, Roemer.

Holectypus planatus, F. Roemer, Texas, 393. *Ibid*, Kreidebild. Texas, 84, taf. x, fig. 2, a—g.

In the collection from Cross-Timbers, Texas, we find several mutilated specimens of *Holectypus*, which we refer without doubt to the above species. Dr. Roemer's examples were obtained from the vicinity of Fredericksburg, Texas.

APPENDIX F.

ZOOLOGY.

MAMMALS, BY R. B. MARCY, CAPT. U. S. A.

REPTILES, BY S. F. BAIRD AND C. GIRARD.

FISHES, BY S. F. BAIRD AND C. GIRARD.

SHELLS, BY C. B. ADAMS AND G. C. SHUMARD, M. D.

ORTHOPTEROUS INSECTS, BY C. GIRARD.

ARACHNIDANS, BY C. GIRARD.

MYRIAPODS, BY C. GIRARD.

APPENDIX F.

ZOOLOGY.

MAMMALS.

BY CAPTAIN R. B. MARCY.

URSUS AMERICANUS, Pall. Black bear. Throughout the valley.

PROCYON LOTOR, L. Raccoon. Throughout the valley.

MEPHITIS MESOLEUCA, (?) Licht. Texan skunk. Throughout the valley.

LUTRA CANADENSIS, Sabine. Otter. Throughout the valley.

BASSARIS ASTUTA, Licht. Civet cat. Cross-Timbers.

CANIS OCCIDENTALIS, Rich. Gray wolf. Above Shreveport.

CANIS LATRANS. Prairie-wolf. Above Cross-Timbers.

CANIS ———. Large Lobos wolf. Above Cross-Timbers.

VULPES FULVUS. Red fox. Red river valley.

LYNX RUFUS. Wild cat. Red river valley.

FELIS CONCOLOR, L. Panther. Red river valley.

SCIURUS MAGNICAUDATUS, (?) Say. Fox-squirrel. Red river valley.

TAMIAS QUADRIVITTATUS, Say. Striped squirrel. Above Cross-Timbers.

PTEROMYS VOLUCELLA, Gm. Flying-squirrel. Red river valley.

CASTOR FIBER, L. Beaver. Above Cross-Timbers.

LEPUS SYLVATICUS, Bach. Rabbit. Red river valley.

LEPUS CALLOTIS, (?) Wagl. Jackass rabbit. Above Cross-Timbers.

LEPUS ARTEMISIA (?) Small prairie rabbit. Above Cross-Timbers.

SPERMOPHILUS LUDOVICIANUS, Ord. Prairie-dog. Above Cross-Timbers.

DIDELPHYS VIRGINIANA, Shaw. Opossum. Red river valley.

CERVUS VIRGINIANA, Penn. Deer. Red river valley.

CERVUS CANADENSIS. Elk; only about Witchita mountains.

ANTILOCAPRA AMERICANA, Ord. Antelope. Above Cross-Timbers.

BOS AMERICANUS, L. Above Cache creek.

REPTILES.

BY S. F. BAIRD AND C. GIRARD.

SERPENTS.

The serpents collected by Captains Marcy and McClellan belong to ten species, distributed into eight genera. Several of these species had previously been received from other sections of the country: three, however, were first collected during the expedition. All are here figured for the first time, except *Ophibolus Sayi*, of which a hitherto undescribed variety is represented.

I. CROTALUS, Linn.

This genus is characterized by its erectile poison fangs, and by having the upper surface of the head covered with small plates resembling the scales on the body, and with only a few larger ones in front. There is a deep pit between the eyes and the nostrils. The plates under the tail are undivided, and the tail is terminated by a rattle. Scales carinated.

1. CROTALUS CONFLUENTUS, Say.

ZOOLOGY, Pl. I.

SPEC. CHAR.—Head subtriangular. Plates on top of head squamiform, irregular, angulated, and imbricated; scales between superciliaries small, numerous, uniform. Four rows of scales between the suborbital series (which only extends to the centre of the orbit) and the labials. Labials 15 or 18, nearly uniform. Dorsal series 27–29. Dorsal blotches quadrate, concave before and behind; intervals greater behind. Spots transversely quadrate posteriorly, ultimately becoming 10 or 12 half rings. Two transverse lines on superciliaries, enclosing about one-third. Stripe from superciliary to angle of jaws, crosses angle of the mouth on the second row above labial. Rostral margined with lighter.

Syn.—*Crotalus confluentus*, Say, in Long's Exped. Rocky Mts. II, 1823, 48. B. & G. Cat. N. Amer. Rept. I, 1853, 8.

C. Lecontei, Hallow. Proc. Acad. Nat. Sc. Philad. VI, 1851, 180.

Description.—This species bears a considerable resemblance to *C. atrox*, but the body is more slender and compact. Scales on the top of the head anterior to the superciliaries nearly uniform in size. Line of scales across from one nostril to the other consists of six, not four as in *C. atrox*. Superciliaries more prominent. Labial series much smaller. Upper anterior orbitals much smaller, as also is the anterior nasal. Scales on the top of the head less carinated. Scales between superciliaries smaller and more numerous, five or six in number instead of four. Two lateral rows of scales smooth; first, second, and third gradually increasing in size. Scales more linear than in *C. atrox*.

General color yellowish brown, with a series of subquadrate dark blotches, with the corners rounded and the anterior and posterior sides frequently concave, the exterior convex. These blotches are ten or eleven scales wide and four or five long, lighter in the centre, and margined for one-third of a scale with light yellowish. The intervals along the back light brown, darker than the margins of the blotches. Anteriorly the interval between the dark spots is but a single scale; posteriorly it is more, becoming sometimes two scales, where also the spots are more rhomboidal or lozenge-shaped; nearer the tail, however, they become transversely quadrate. The fundamental theory of coloration might be likened to that of *Crotalus adamanteus*, viz: of forty or fifty light lines decussating each other from opposite sides; but the angles of decussation, instead of being acute, are obtuse, and truncated or rounded off throughout. Along the third, fourth, and fifth lateral rows of scales is a series of indistinct brown blotches covering a space of about four scales, and falling opposite to the dorsal blotches: between these blotches, and opposite to the intervals of the dorsal blotches, are others less distinct. Along the fifth, sixth, seventh, and eighth rows is a second series of obsolete blotches, each covering a space of about four scales, and just opposite the intervals between the dorsal spots. The dorsal and lower series are separated by an interval of three scales, this interval light brown. Beneath, the color is dull yellowish, and ten or twelve darker half rings are visible on the tail.

In point of coloration the principal features, as compared with *C. atrox*, lie in the disposition of the dorsal blotches in subquadrate spots instead of subrhomboids; the intervals thus forming bands across the back perpendicular to the longitudinal axis. This tendency to assume

the subquadrangular pattern has broken up the chain-work into isolated portions, as in *Ophibolus eximius* or *Crotalophorus tergeminus*. The intervals of the dorsal blotches are wide and darker in the middle, while in *C. atrox* they are narrow, not linear, and unicolor. The sides of the head present the usual light stripe from the posterior extremity of the superciliary; it passes, however, to the angle of the jaw on the neck, along the second row of scales above the labials. A second stripe passes in front of the eye to the labials, widening there. A small light vertical bar is seen below the pit, and another on the outer edge of the rostral. On the superciliaries are two light transverse lines enclosing a space nearly one-third of the whole surface. In *C. atrox* there is a single median line. Sometimes, as in *C. atrox*, the single blotches on the nape are replaced by two elongated ones parallel to each other.

Dorsal row of scales, 29; abdominal scutellæ, 180; subcaudal ones, 27. Total length, 34 inches; length of tail, 4 inches.

A specimen was collected the 5th of June in the Witchita mountains. Another specimen of the same species was brought home from the Cross-Timbers, Arkansas, by Dr. S. W. Woodhouse, and described by Dr. Hallowell as new, under the name of *Crotalus Lecontei*, on the ground that the anterior vertebral spots are not confluent. This we do not consider as a sufficiently distinctive character, although we have never seen a specimen with decidedly confluent markings. The notes of Dr. Leconte, quoted by Dr. Hallowell, hardly apply to the present species.

The species was first discovered by Say on Major Long's expedition to the Rocky mountains, and has not since been seen until procured first by Dr. Woodhouse, and then by Captain Marcy and the Mexican boundary commission. It was found by the latter party in Western Texas, where, however, it is rare.

Plate I represents *Crotalus confluentus* of natural size.

II. EUTÆNIA, B. & G.

This genus is composed of numerous species, some of them quite common, and known under the names of Riband, Striped, and Garter snakes: inoffensive, like most of the North American snakes. They may be recognised by three light stripes on a darker ground, the intervals between these stripes provided with alternating or tessellated

blackish spots. The scales have a ridge or small keel along their middle, and are arranged in 19 or 21 longitudinal rows. The postabdominal or anal scutella is entire, like the others. There is one anterior orbital plate and three posterior. The body is either moderately stout or else slender, according to the species. Of the two described in this article, one belongs to the division with a slender body and 19 dorsal rows of scales, and the other to the second division, with a stouter body and 21 dorsal rows of scales.

2. Eutænia proxima, B. & G.

Zoology, Pl. II.

Spec. char.—Body stoutest of the division. Black above; three longitudinal stripes, the dorsal ochraceous yellow or brown, lateral greenish white or yellow. Total length about three and a half times that of the tail.

Syn.—*Coluber proximus*, Say, in Long's Exped. to Rock. Mts. I, 1823, 187.—Harl., Journ. Acad. Nat. Sc. Philad. V, 1827, 353.
Eutainia proxima, B. & G. Cat. N. Amer. Rept. I, 1853, 25.

Desc.—Deep brown, almost black, above and on the sides; beneath greenish white. Dorsal stripe on one and two half rows of scales, ochraceous yellow, lateral stripe on the 3d and 4th rows of scales, greenish yellow or white, markedly different in tint from the dorsal. Sides of abdominal scutellæ, and 1st and 2d dorsal series, of the same color as the back. On stretching the skin, numerous short white lines are visible. Occipital plates with two small approximated spots on the line of junction. Orbitals whitish. The greenish white of the abdomen becomes more yellow anteriorly.

Head more like that of *E. saurita* than of *E. Faireyi*, while the body is stouter than in either. The subcaudal scales are less numerous than in the other two allied species. Resembling *E. Faireyi* in color, it is always distinguishable by the stouter body, fewer caudal scales, and dissimilarity of color in the longitudinal stripes.

Dorsal rows of scales 19, all keeled; abdominal scutellæ 170; subcaudal ones 100. Total length 33 inches; length of tail 9 inches. Found at Camp No. 7.

The species is represented in natural size on Plate II.

3. Eutænia marciana, B. & G.

Zoology, Pl. III.

Spec. char.—Prominent color light brown; a vertebral paler line and one lateral on each side, more or less indistinct. Three series of square black spots on each side, of about 56–60 in each series, from occiput to anus. Sides of head black, with a crescentic patch of yellowish posterior to the labial plates. Three and sometimes four black vittæ radiating from the eye across the jaws. A double white spot with a black margin on the suture of occipital plates.

Syn.—*Eutainia marciana*, B. and G. Cat. N. Amer. Rept. I, 1853, 36.

Desc.—The markings about the head are generally very constant and distinct. Viewed laterally, we see first the large dark-brown patch at the back part of the head, extending as far back as the posterior extremity of the jawbones. In the anterior part of this patch is seen the crescentic patch (concave before) of yellowish white, with a more or less narrow dark-brown margin anteriorly. The next black band starts from the posterior edge of the superciliaries, and passes obliquely downwards and backwards along the posterior edge of the 6th upper labial. Similar black margins are seen on the posterior edges of the 5th and 4th labials, the intervening spaces being yellowish white, particularly on the 5th upper labial. Occasionally the posterior margins of the 7th and 3d labials have the black line as well as those mentioned, which frequently extend across to the posterior margins of the corresponding lower labials. The white spot on the anterior portion of the occipital suture is always margined with black.

The six series of black spots are arranged so as to alternate with each other. The lower or third series on each side is below the indistinct lateral stripe. The posterior edge of each abdominal scutella shows a black margined spot on each side. The dorsal line is generally a single scale in width, occasionally including portions of the lateral, and itself sometimes encroached upon by the black spots. Each spot is about a scale or a scale and a half long, and about three scales broad. The number in the dorsal series from the head to the anus varies from 56 to 60. Posterior edges of scales very slightly emarginate, if at all. All are decidedly keeled.

Dorsal scales disposed in 21 rows; abdominal scutellæ, 152; subcaudal, 75. Total length 34 inches; length of tail, 8 inches.

Collected between Camp 5 and Red river, on the open prairie.

This species is very widely distributed in the south and west. Red river forms its limit on the north, and the Gulf of Mexico on the east;

but it extends to the Rocky mountains on the west, and far into Mexico on the south. Its centre of distribution appears to be on the lower Rio Grande.

Plate III represents this species in natural size.

III. HETERODON, Pal. de B.

This genus is eminently characterized by the peculiarity of its snout, which is terminated by a triangular plate recurved upwards; hence the popular appellation of hog-nose snake. Though perfectly harmless, they exhibit a threatening appearance, when approached, in the flattening of their head and violent hissings; hence the names of blowing-viper, spreading adder, &c. Their body is short, stout, and the tail also short. The head is broad and short. The dorsal scales are carinated, and arranged in 23–27 rows. The preanal or postabdominal scutella is bifid; a chain of small plates beneath the eye, completed above by the superciliaries. There is a supplementary plate on the top of the head, behind the prominent rostral, either in contact with the frontals, or separated by smaller plates. The colors are light, with dorsal and lateral darker blotches, or else brown, with dorsal transverse light bars; sometimes entirely black.

One species only was collected on the Red River exploration. Six species are known to exist in the United States.

4. HETERODON NASICUS, B. & G.

ZOOLOGY, Pl. IV.

SPEC. CHAR.—Vertical plate broader than long. Rostral excessively broad and high. Azygos plate surrounded behind and on the sides by many small plates (12–15.) A second loral. Labials short and excessively high. Dorsal rows of scales 23, exterior alone smooth. A dorsal series of about 50 blotches, with four or five other series on each side. Body beneath, black. A narrow white line across the middle of the superciliaries; a second behind the rostral. A broad dark patch from the eye to the angle of the mouth, crossing the two postlabials.

SYN.—*Heterodon nasicus*, B. & G. Reptiles in Stansbury's Expl. Valley of Great Salt Lake, 1852, 352.—B. & G. Cat. N. Amer. Rept. I, 1853, 61.

Desc.—Vertical plate very broad, subhexagonal. Occipitals short. Rostral very broad, high, more so than in the other species, outline rounded. The interval between the opposite frontals, the rostral, and the vertical occupied by a number of small plates, from 10 to 12, or more, arranged without any symmetry, on each side and behind the small azygos. The base of the rostral between the opposite prenasals is generally margined by these small plates, which sometimes, too, are seen between the vertical and the anterior portion of the superciliaries. This crowding of plates causes the anterior part of the forehead to be broader than in *H. simus*. Eye small, its centre rather posterior to the middle of the imaginary line connecting the tip of rostral with the lower angle of the postlabial, which line scarcely crosses the eyeball. Orbital plates, 10–13 in number. Loral triangular, rather longer than high, separated from the frontal by a small plate. Nasals rather short, occasionally with the lower part of the nostril bounded by a small plate. Labials 8 or 9 above, all of them higher than long; indeed, their vertical extension is much greater than in any other species: the 6th highest; centre of eye over the junction of the 5th and 6th.

Dorsal rows of scales 23, outer row smooth, rest all distinctly carinated, the keels extending to the ends of the scales; those just behind the occipital plates truncated, with obsolete carinæ. Scales on the hind part of the body rather broader and shorter than anteriorly; the inequality scarcely evident in large specimens.

Ground-color light brown or yellowish gray, with about 50 dorsal blotches from head to tip of tail; the 39th opposite the anus. These blotches are quite small, rather longer transversely, subquadrate, or rounded, indistinctly margined with black, (obsoletely on the outside;) they cover 7 to 9 scales across, are 2 to 2½ long, and separated by interspaces of 1½ scales, which are pretty constant throughout, though rather narrower on the tail. On each side of the dorsal row may be made out, under favorable circumstances, four alternating rows of blotches; the first on the contiguous edges of the scales of the first and second exterior dorsal rows; the second on the scales of the 3d row, and the adjacent edges of those in the 2d and 4th; the third on the scales of the 4th, 5th, and 6th, and the adjacent edges of the 3d and 7th; and the fourth on the scales of the 6th, 7th, and 8th rows, and the adjacent edges of those of the 5th. This last is opposite the intervals of the dorsal series; the rest alternate with it. The central inferior surface of the abdominal scutellæ is black, sharply variegated with quadrate spots of yellowish white; the portion of the scutellæ entering into the side of the body is yellowish white, with that part opposite the dorsal intervals

dark brown, thus, in fact, constituting a fifth lateral series of blotches, alternating with the lowest already mentioned. The throat and chin are unspotted. The head is light brown, with a narrow whitish line finely margined before and behind with black, which crosses in front of the centre of the vertical, and through the middle of the superciliaries: a second similar but more indistinct line runs parallel to this just behind the rostral, and extending down in front of the eye. A third equally indistinct and similar line crosses the posterior angle of the vertical, and runs back on the side of the neck, behind the labials and temporal shields. There is a broad brown patch from the back part of the eye to the angle of the mouth, across the penultimate and last labial. The coloration is thus very different from that of *H. Simus*, where there is a distinct narrow black band across the forehead scarcely involving the vertical, and passing through the eye to the angle of the mouth across the last labial. Behind this a much broader yellowish band, continued without interruption into the neck behind the angle of the mouth. In *H. nasicus* the most conspicuous feature is a narrow white band, much narrower than the darker patch before and behind it. The dark patch, to the angle of the mouth, is much broader, continuous as it were, with the broad bar between the middle and anterior light lines, which corresponds with the narrow black line of *H. Simus*. The other distinguishing features are evident. The three dark patches behind the head are much as in *H. simus*.

In large specimens from Sonora and the Copper Mines of the Gila, (Fort Webster), the ground-color is yellowish gray, each scale minutely punctate with brown. The blotches are all obsolete, only one dorsal and two lateral on each side being defined by darker shades. The blotches on the sides of the abdomen are wanting, but the black in the middle is strongly marked. The other characters, however, are preserved, except that the exterior row of dorsal scales is more or less carinated.

Specimens of this species vary in the number of small postrostral plates. In some there are only three or four, in others a larger number. Sometimes, instead of a single series of median dorsal spots, there are two, in close contact, and more or less confluent. The narrow light line across the middle of the superciliaries and the high labials are always highly characteristic.

The specimen figured of natural size on plate IV, is much smaller than those alluded to from Sonora and the Copper Mines, and upon which the foregoing description has been based.

IV. PITUOPHIS, Holbr.

This genus, closely allied to *Heterodon*, is characterized by a prominent snout, the rostral plate elevated and convex, without, however, being recurved. There are two pairs of postfrontal plates instead of one, and occasionally also two verticals; three or four postorbitals; generally two, sometimes only one anteriorly. The scales are carinated along the back, smooth on the sides, and constituting from 29–35 dorsal rows. The preanal or postabdominal scutellæ is entire.

The ground-colors are either whitish or reddish yellow, with a triple series of patches, those of the medial series the largest, and several series of smaller blotches on the sides. Abdomen unicolor or spotted, with an outer row of blotches. Head of same color as the body, maculated with black spots. A narrow band of black across the upper surface between the eyes, and a postocular vitta on each side, extending obliquely from the eye down to the angle of the mouth. A black vertical patch is often seen beneath the eye.

The names of Bull, Pine, and Pilot snake are commonly given to different species of this genus, which are all of great size, including in fact some of the largest serpents of North America. Some of the species utter a hissing or blowing sound.

5. Pituophis McClellanii, B. & G.

Zoology, Pl. V.

Spec. char.—Head subelliptical. Rostral plate very narrow. Anteorbitals 2; postorbitals 4. Dorsal rows 33–35; the 7 outer rows smooth. Tail forming 1·9 or 1-10 of total length. Postocular vitta brown, and rather broad. Suborbital black patch conspicuous; commissure of labials black. Color of body reddish yellow, with a series of 53 blotches from head to origin of tail. Blotches of adjoining series, on either side, confluent across the light spaces between medial blotches. Flanks covered with small blotches, forming 3 or 4 indistinct series. Twelve transverse jet-black bars across the tail. Abdomen yellowish, thickly maculated with black patches.

Syn.—*Pituophis McClellanii*, B. & G. Cat. N. Amer. Rept. I, 1853, 68.—Pilot-snake.

DESC.—Head proportionally large, ovoid, distinct from the body. Snout pointed. Occipital plates small. Vertical broad, subpentagonal, slightly concave on the sides. Superciliaries large. Internal postfrontals rather narrow, elongated; external postfrontals quadrilateral, a little broader forwards. Prefrontals irregularly quadrangular. Rostral very narrow, extending halfway between the prefrontals, convex and raised above the surface of the snout. Nostrils in the middle line between the nasals, the posterior of which is a little the smaller. Loral trapezoidal, proportionally large. Inferior anteorbital very small, resting upon the fourth upper labial. Postorbitals varying in comparative size. Temporal shields small, resembling scales. Upper labials 8; 6th and 7th the larger. Lower labials 12; 6th and 7th largest. Posterior mental shields very small, extending to opposite the junction of the 7th and 8th lower labials. Scales proportionally small, in 33–35 rows, the 7 outer ones perfectly smooth and somewhat larger than the remaining rows.

Ground-color yellowish brown, with three series of dorsal black blotches, 53 in number, from the head to opposite the anus, with 12 on the tail, in the shape of transverse bars. Those of the medial series the larger, and covering 8 or 9 rows of scales. On the anterior part of the body they are subcircular, embracing longitudinally four scales; posteriorly they become shorter by one scale. The light spaces between are a little narrower than the blotches themselves for the twelve anterior blotches, and wider than the blotches for the remaining length of the body. The blotches of the adjoining series alternate with those of the medial series, being opposite to the light intermediate spaces, across which the blotches of either sides are generally united by a transverse narrow band. The flanks are densely covered with small and irregular blotches, forming three indistinct series, confluent in vertical bars towards the origin of the tail. Inferior surface of the head yellowish, unicolor Abdomen dull yellow, with crowded brownish black blotches in series on the extremity of the scutellæ.

Two specimens of this species were caught the 28th of June. The largest is figured, of natural size, on plate V. It is 38¼ inches in length; the tail measuring nearly 5 inches. Abdominal scutellæ 231; subcaudal ones, 52.

V. SCOTOPHIS, B. & G.

The scales in this genus are very slightly carinated on the back, and perfectly smooth on the sides. Preanal scutella bifid. One large ante-

orbital plate and two postorbitals. The colors are brown or black, in quadrate blotches on the back and on the sides, separated by lighter intervals; beneath usually coarsely blotched with darker. In one species there are dark stripes on a light ground.

6. Scotophis laetus, B. & G.

Zoology, Pl. VI.

Spec. char.—Similar to *S. confinis*, but postfrontals larger. Vertical plate longer than broad. Dorsal rows 29. Abdominal scutellæ 227. Subcaudals 72. Blotches fewer than in *S. confinis*.

Syn.—*Scotophis laetus*, B. & G. Cat. N. Amer. Rept. I, 1853, 78.

Desc.—This species bears a close resemblance to *S. confinis*, and its characters may be best given by comparison with the latter. It differs, therefore, in the greater number of dorsal rows, 29 instead of 25. The whole body and head are much stouter. Exterior eight rows smooth, rest slightly carinated. The vertical is broad before, rather acute behind. A probably monstrous feature is seen in the union of the two postfrontals, except for a short distance before, and in the loral and postnasal coalescing into one trapezoidal plate. Blotches less numerous. A broad vitta across the back part of the postfrontals, passing backwards and downwards through the eye, and terminating acutely on the posterior upper labial. A blotch across the back part of the vertical, and extending through the occipitals on each side to the nape. The spots are larger, longitudinal throughout, with occasional exceptions.

Its affinities to *S. vulpinus* are close. The vertical, however, is narrow, the eyes much larger, dorsal rows 29 instead of 25. The blotches on the back are longitudinal, and fewer in number. For a complete description of this species it will be necessary to procure larger specimens.

The specimen figured on Plate VI is of natural size. The only one caught of this species is 18 inches long. Length of tail 3¼ inches.

VI. OPHIBOLUS, B. & G.

The body is rather thick, and the tail short. The scales smooth and lustrous, and disposed in 21 or 23 rows, which scarcely overlap. The preanal scutella is entire. A small anteorbital plate and two postorbitals. Eyes very small.

The ground-colors are black, brown, or red, crossed by lighter intervals, generally bordered by black.

Seven species, besides the two here described, have hitherto been found in North America.

7. Ophibolus Sayi, B. & G.

Zoology Pl. VII.

Spec. char.—Black, each scale above with a large circular or subcircular white or yellow spot in the centre. Sometimes only transverse lines of these spots across the back.

Syn.—*Herpetodryas getulus*, Schl. Ess. Phys. Serp. Part. descr. II, 1837, 198.

Coronella Sayi, Holbr. (non Schl.) N. Amer. Herp. III, 1842, 99. Pl. xxii.

Coluber Sayi, Dekay, New York Fauna, Rept. 1842, 41.

Ophibolus Sayi, B. & G., Cat. N. Amer. Rept. I, 1853, 84.

Desc.—Body, as in most of the other species of the same genus, very tense and rigid, with difficulty capable of being extended after immersion in alcohol. Vertical plate triangular, wider than long; outer edge slightly convex, an angle being faintly indicated at the junction of the superciliaries and occipitals; shorter than the occipitals, which are short, longer than broad. Postfrontals large, broad; prefrontals smaller. Rostral small, not projecting, slightly wedged between prefrontals. Eye very small, orbit about as high as the labial below it; centre of the eye a little anterior to the middle of the commissure, over the junction of the 3d and 4th labials. One anteorbital, vertically quadrate; loral half its height, square. Upper labials 7, increasing to the penultimate. Lower labials 9; 4th and 5th largest.

Scales nearly as high as long, hexagonal, truncated at each end. Dorsal rows 21, exterior rather larger, and diminishing almost imperceptibly to the back, although all the scales in a single oblique row are of very nearly the same shape and size.

The scales on the back and sides are lustrous black, each one with a central elliptical or subcircular spot of ivory-white, which on the sides occupy nearly the whole of the scale, but are smaller towards the back, where they involve one half to one third of the length. Beneath yellowish white, with broad distinct blotches of black, more numerous posteriorly. Skin between the scales brown. The plates on the top and sides of the head have each a yellowish blotch; the labials are yellow, with black at their junction.

Other specimens agree except in having bright yellow instead of white as described; the spots, too, are rather smaller, and manifest a slight tendency to aggregation on adjacent scales, so as to form transverse bands. This is seen more decidedly where the back is crossed by about 70 short dotted yellow lines; the 56th opposite the anus. The scales between have very obsolete spots of lighter, scarcely discernible. The sides are yellow, with black spots corresponding to the dorsal lines; indeed, there may be indistinctly discerned two or three lateral series of alternating blotches.

In larger specimens from the West, this tendency in the spots to aggregation is still more distinct. The back is crossed by these dotted lines of the number and relation indicated, at intervals of four or five scales; the spots on the intervening space being obsolete. These lines bifurcate at about the 9th outer row, the branches connecting with those contiguous, so as to form hexagons; and these extending towards the abdomen again, decussate on about the third outer row, thus enclosing two series of square, dark spots on each side. These lateral markings are, however, not very discernible, owing to the confusion produced by the greater number of yellow spots. On the edge of the abdomen are dark blotches, one opposite each dorsal dark space, the centres of the scutellæ being likewise blotched, but so as rather to alternate with those just mentioned.

The specimen represented on Plate VII was caught the 16th of May, between Cache creek and Red river. Total length 33¼ inches; tail 3¾ inches; abdominal scutellæ 224; subcaudals 49.

8. Ophibolus gentilis, B. & G.

Zoology, Pl. VIII.

Spec. char.—Muzzle more convex and acute than in *O. doliatus*. Body red, encircled by about 25 pairs of broad black rings enclosing a white ring: the white mottled with black on the sides. Black rings broader than in *O. doliatus*. Upper part of head entirely black.

Syn.—*Ophibolus gentilis*, B. & G. Cat. N. Amer. Rept. I, 1853, 90.

Desc.—Ground-color deep red, encircled by 25 pairs of black rings, the 21st opposite the anus, each pair enclosing a third ring of white, the latter becoming yellowish by immersion in alcohol. The black rings are conspicuously broader above, the three crossing eight scales on the vertebral row anteriorly, and towards the anus about five. Anteriorly the intervals between successive pairs consist of about five scales, posteriorly only of two or three, thus diminishing considerably. The black rings con-

tract as they descend, those of each pair receding slightly from each other, so as to cause the yellow portion to expand about one scale. The black rings are continuous on the abdomen, those of contiguous pairs (not of the same pair) sometimes with their intervening spaces black. The scales in the white rings are always more or less mottled with black, especially along the sides of the body, this mottling being very rarely observable on the red portion. The anterior black ring of the first pair is extended so as to cover the whole head above, except the very tip; the white ring behind it involves the extreme tip of the occipitals.

A large specimen is much duskier in its colors. The black rings extend on the back so that the contiguous rings of adjacent pairs run into each other. There are 28 pairs of rings, the 25th opposite the anus.

Dorsal row of scales, 21; abdominal scutellæ, 198; subcaudal ones, 45. Total length, 20 inches; length of tail, 2¾ inches. Plate VIII represents the largest of two specimens, caught June 14, near Sweetwater creek.

VII. MASTICOPHIS, B. & G.

The prominent feature of this genus consists in a very slender and elongated tail, forming one-third or one-fourth of the length. It bears a close relationship to the black snakes (*Bascanion*), from which it differs chiefly in the structure of the plates on the upper jaw. The scales are smooth and disposed in fifteen or seventeen dorsal rows. The preanal scutella is divided. The vertical plate is long and narrow. There are two anteorbitals and two postorbitals, these resting against the fifth labial.

9. Masticophis flavigularis, B. & G.

Spec. char.—Light dull yellow, tinged with brown above. Beneath, two longitudinal series of blotches distinct anteriorly. In alcohol, and especially when the epidermis is removed, the whole animal appears of a soiled white.

Syn.—*Psammophis flavigularis*, Hallow. Proc. Acad. Nat. Sc. Philad. VI, 1852, 178.

Masticophis flavigularis, B. & G. Cat. N. Amer. Rept. I, 1853, 99.

Desc.—Size very large. Vertical plate broad before, tapering to the middle, where it is about half as wide as anteriorly, thence it runs nearly

parallel. Vertical rather shorter than occipitals. Greatest breadth across superciliaries less than half the length of the portion covered by plates. Occipitals moderate. Centre of eye considerably anterior to the centre of commissure, over the junction of the 4th and 5th labials. Labials 8 above, increasing in size to the 5th, which is elongated vertically, the 7th elongate and largest. The 5th forms part of the inferior and posterior wall of the orbit, as in all the species of the genus, resting above against the lower postorbital, with which the 6th labial is not in contact. Dorsal scales broader than in *Bascanion constrictor*, their sides perfectly straight, slightly truncate, with the corners rounded. Exterior row largest, rest gradually diminishing. Scales on the tail widely truncate.

The general color, both above and below, may be described as a dull straw-yellow, tinged with light olivaceous brown above. This latter tint exists in the form of a shading on the centres and towards the tips of the scales, leaving the bases yellowish. The proportion of brown increases towards the back, and in older specimens sometimes suppresses the yellow. In all instances a darker shade is seen towards the tip of each scale. The skin between the scales is yellowish. The scutellæ anteriorly exhibit each two rather large brownish blotches, one on each side of the median line, constituting two rows on the abdomen, which fade out posteriorly. Sometimes the series are not discernible, the blotches spreading so as to constitute a dark shade to the margins and exterior edges of the scutellæ. The posterior portions of the plates under, and on the sides of the head, are similarly blotched; the same tendency being observable on the posterior edges of the plates on the top of the head, by the deeper shade of the olivaceous brown there prevalent. Anteorbitals yellow. One specimen was procured 57½ inches long. Abdominal scutellæ 191+2. The tip of the tail is missing.

In smaller specimens the blotching beneath is rather more decided. In addition to the colors described, the back is crossed by indistinct bars of darker, eight or nine scales wide and half a scale long. This color is also seen on the skin between the scales under the dark bars, where the bases of the scales themselves are darker instead of light. There is a tendency towards stripes on the side: first one of light brown, on the outer edge of the abdomen; then an interrupted yellow one at the junction of the abdominal scutellæ and outer scales; then brown again through the centres of the rows. This, however, is not very conspicuous. Sometimes the dark shades on the sides are tinged with reddish. The obsolete transverse bars are seen at intervals of one or two scales.

This species may prove to be the *Coluber testaceus* of Say. A specimen from Fort Webster, or the Copper Mines, collected by the U. S. and Mexican Boundary Commission, shows the stripes on the sides much more distinctly, running through all the dorsal rows anteriorly, and crossed by the indistinct bars already referred to. The contrast between the dark chestnut-brown spots on each side, and its deeper centre, with the clear yellow of the edges, is very distinct. Beneath yellow, with the blotches reduced to mere dull spots.

VIII. LEPTOPHIS, Bell.

The body is elongated and very slender, the tail forming more than the third of the entire length. The scales are disposed in 17 dorsal rows and keeled, except the two outer rows, which are smooth. The nostril is situated in the middle of a single plate. The eyes are large. The preanal scutella is bifid or divided. The color uniformly green.

10. Leptophis majalis, B. & G.

Zoology, Pl. IX.

Spec. char.—Reddish green above, yellowish white beneath. Body proportionally stouter and tail shorter than in *L. æstivus*. Snout and whole head, including vertical, longer than in latter species. Dorsal scales in 17 rows.

Syn.—*Leptophis majalis*, B. & G. Cat. N. Amer. Rept. I, 1853, 107.

Desc.—Head more pointed, broader on the temporal region, and more tapering on the snout than in *L. æstivus*. Vertical plate subhexagonal, broader, and postfrontals proportionally larger in comparison with the prefrontals, than in *L. æstivus*. Occipitals maintaining more their width posteriorly, obtuse-angled behind. Nasal more elongated; loral smaller, and longer than high. Two large temporal shields and a few small ones behind. Scales strongly carinated, except the outer row, which is perfectly smooth, and the second row, which is but slightly carinated. The scales of both of these rows are broader than the rest.

Total length, 28½ inches; length of tail, 9¾ inches. Abdominal scutellæ, 163+1; subcaudal, 111. The specimen figured on Plate IX was caught on the 13th of July at the head of Cache creek, near old Witchita village.

LIZARDS.

Six species of saurians, or lizards, belonging to six different genera, were collected during the exploration of Red river. One of them has proved to be new to science; two were recently described for the first time, whilst the three others have been long known to herpetologists.

I. PHRYNOSOMA, Wiegm.

This genus, including the so-called horned toads or horned frogs, more properly horned lizards, is recognizable by a depressed, broad, and subelliptical body, covered above with irregular scales, the majority very small, others quite large, pyramidal, raised above the surface of the skin, and scattered all over the back, sides, and tail. The head is subtriangular and provided with powerful spines or horns, giving to it rather a formidable appearance, although all the species of this genus are perfectly inoffensive. There are external auditive apertures as in most of the lizard tribe.

In a monograph of the genus appended to Stansbury's Exploration of the Valley of the Great Salt Lake of Utah, six species are described as indigenous to North America; another has since been added to the list. The single species collected is the most abundant of the genus.

1. PHRYNOSOMA CORNUTUM, Gray.

SPEC. CHAR.—Nostrils situated within the internal margin of the superciliary ridge; occipital and temporal spines longer and more acute than in *Ph. orbiculare;* a double row of pyramidal scales on the sides of the abdomen; scales on the inferior surface of the head small and slightly keeled, of a general uniformity, except one row on each side, somewhat larger, pyramidal, acute, slightly raised, and directed outwards and backwards; a series of very large inframaxillary plates, sharp on their outer edge, the posterior one of which is transformed into a spine. The plates lining the margin of the jaws are not prominent. The scales of the belly are proportionally small, subquadrangular, keeled, and posteriorly very acute; femoral pores undeveloped, or rudimentary in the female.

Syn.—*Phrynosoma cornutum*, Gray, Syn. Rept. in Griff. Anim. Kingd. IX, 1831, 45. Holbr. N. Amer. Herp. II, 1842, 87. Pl. xi.—Girard in Stansbury's Expl. Val. Great Salt Lake, 1852, 360. Pl. viii, fig. 1—6.

Agama cornuta, Harl. Med. and Phys. Res. 1835, 141. Plate, figs. 1 and 2.

Phrynosoma Harlani, Wiegm. Herp. Mex. 1834, 54.—Dum. and Bibr. Erp. gen. IV, 1837, 314.

Obs.—The color of this species has been well described by Dr. Holbrook. We may add that the ground-color above in some individuals is of a variable shade of ferruginous red—a tint sometimes seen on the inferior surface of the body. The belly is either unicolor, or else spotted as in *P. orbiculare*. Numerous specimens of this species were collected during the exploration of Red river; some on the prairie between Camps 2 and 3; others between Camps 6 and 7, and at Camp 7 also; others still on the south fork of Red river, and several other localities.

II. CROTAPHYTUS, Holbr.

Noticed for the first time during Major Long's expedition. The type of this genus was briefly described by Say in the second volume of Long's Narrative, and there called *Agama collaris*, in allusion to the very striking feature of bearing a double black sub-crescentic band on the sides of the neck. The genus *Crotaphytus* was first established by Dr. Holbrook, and is characterized by the presence of small, polygonal plates on the whole surface of the head. The odd occipital plate itself is inconspicuous; the auditive apertures are very broadly open. Teeth are found on the jaws and palate. There is a fold of the skin under the throat; the head is large and sub-triangular; the body covered with minute scales; and the tail very long and tapering. Femoral pores present.

This genus now includes four North American species; three we have lately described under the names of *C. Wislizenii*, from New Mexico, *C. Gambelii*, from California, and *C. dorsalis*, from the desert of Colorado; the fourth is the following:

2. CROTAPHYTUS COLLARIS, Holbr.

SPEC. CHAR.—Tail conical, very long and tapering; head large, sub-triangular, rounded at the snout; two subcrescentic black bars, margined with white on each side of the neck; the largest extends from the origin of the fore-legs to near the dorsal line; the second of these black bars is smaller, and situated between the latter and the head.

SYN.—*Crotaphytus collaris*, Holbr. N. Amer. Herp. II, 1842, 79. Pl. x.

Agama collaris, Say, in Long's Exp. Rocky Mts. II, 1823, 252.—Harl. Med. and Phys. Res. 1835, 142.

OBS.—The specimens on hand exhibit several varieties of coloration worthy of being noticed: thus two specimens from Gypsum Bluffs, on Red river—a rocky locality—present a green ground-color above, with large blue patches and bright yellow spots; underneath light-green, almost uniform, except under the head, which is deeper and provided with blue, irregularly elongated spots; another specimen from the same locality has brown as the predominating tint. Light-brown stripes are seen on the legs and tail; similar spots on the body and head; four rows of red spots on the back; belly light-brown; light reddish-brown under the tail and feet.

Specimens from the head of the south fork of Red river have either a bluish-gray back, with white spots, a bluish-white belly, and the inferior surface of fore-legs reddish, or else the back is yellow and green.

The above memoranda, on the coloration, were taken on the spot by Capt. Marcy. The general distribution of color appears to indicate sexual differences: thus all the specimens before us in which the spots have a tendency to arrange themselves in transverse bands, or even where transverse narrow bands take the place of the spots, have proved to be females. The ground-color, however, varies in both sexes.

III. HOLBROOKIA, Girard.

The genus *Holbrookia* bears a striking resemblance to the one just described; it has the same general form, the same sub-triangular head, covered with small polygonal plates, a fold under the throat, small scales on the back, and femoral pores. The tail is perhaps smaller in proportion to the size of the body. The absence of an external auditive

aperture will, however, at once characterize it generically from all its allies. The absence of teeth on the palatine bones is another organic character by which the genus *Holbrookia* can be distinguished from *Crotaphytus*. From *Homalosaurus* it differs only by the absence of an external auditive aperture.

The species upon which the genus was originally based is the one collected by the expedition.

Three other species were found in Texas, and described by us under the names of *H. affinis*, *propinqua*, and *texana*, (see Proceedings of the Academy of Natural Sciences of Philadelphia, August, 1852).

3. Holbrookia maculata, Girard.

Spec. char.—Above light-brown, with two dorsal series of irregularly crescent-shaped black spots convex posteriorly, and provided with an olivaceous margin; flanks with small crowded yellowish or reddish spots; two, occasionally three, deep-bluish black spots on the sides of the abdomen; beneath unicolor, either of a soiled white or yellow tint; sometimes irregular bluish vittæ under the head.

Syn.—*Holbrookia maculata*, Girard, Proc. Amer. Assoc. Adv. of Sc. IV, (1850), 1851, 201; and in Stansbury's Expl. Valley of Great Salt Lake, 1852, 342. Plate vi, fig. 1—3.

Obs.—A full description, as well as a figure of this species, may be found in the Report of Captain Howard Stansbury on the Valley of the Great Salt Lake of Utah; rendering it unnecessary to reproduce either here.

Numerous specimens were collected on the Canadian river and surrounding localities.

IV. SCELOPORUS, Wiegm.

The genus has the general appearance of *Holbrookia*, but is provided with large auditive apertures, large imbricated and carinated scales on the back in most instances; and smooth scales on the belly. The subguttural fold of the former, however, is not to be seen here and on the surface of the head; the plates, though small, are larger, especially the occipital. There are no teeth on the palate.

Most of the species of this genus are Mexican: one is common in the United States, and known as the brown or fence lizard. A second species was discovered by Captain Stansbury in the valley of the Great Salt Lake. Another species inhabits the western States, and a fourth is peculiar to Oregon.

4. Sceloporus consobrinus, B. & G.

Zoology, Pl. X, Figs. 5–12.

Spec. char.—Ground color above brownish, with a series of small black spots, eight or ten in number, on each side of the dorsal line. A yellowish stripe outside of the spots, and a black band beneath the stripe. A greenish area between the black band above and the elongated blue patch on the sides of the abdomen. Beneath, greenish blue.

Desc.—This species bears a close relationship to *S. graciosus*, from the valley of the Great Salt Lake of Utah, in the description of which the remarkably large size of the dorsal scales was mentioned as constituting one of its most distinguishing features, when compared to *S. scalaris*. In the present species the dorsal scales are proportionally still larger than in *S. graciosus*. Its body and head are also more slender and narrower. The tail is more tapering and elongated, and constitutes almost three-fifths of the total length. In coloration the differences between the two species are very striking.

The head is subelliptical, depressed, declive towards the snout, which is rather pointed. The superciliary region is but slightly raised above the plane of the vertex. The rostral plate is subtriangular, very low, and elongated transversely. The nostrils are almost circular, situated in the middle of a small plate, separated from the rostral by two small intervening ones. There are ten or twelve internasal and very small plates, and nine somewhat larger frontals, the middle one the largest. There are two verticals (or frontals), the anterior one the largest. The occipital is large and pentagonal, surrounded by four or six smaller plates, two anterior of medium size, contiguous to the postvertical, two lateral, larger and triangular, exteriorly to which two smaller ones may be observed. There are three or four subhexagonal, transversely elongated, plates on the superciliary region, surrounded internally by one row and externally by two rows of minute plates. The superciliary edge is formed by five sharp and imbricated thin plates; it is continued in the shape of a ridge to the nostril by means of two sharply keeled plates. The suborbitals are two in number, the posterior one much the longest. There is a small loral.

The plates which line the jaws are subquadrangular, very narrow and elongated, four above and five below, the latter considerably larger. Above the series of plates of the upper jaw, and between the suborbitals, two series of small and irregular plates may be observed. Four or five inframaxillary plates constitute a series on each side of the lower surface of the head, joined anteriorly by the subpentagonal symphysal plate. Between the inframaxillary series and the series lining the lower jaw exists a series of four or five elongated and small plates.

The auditive aperture, which is proportionally large, is oval, and almost vertical in its longest diameter. At its anterior margin may be seen two or three scales, larger and more pointed than those on the temporal region. Behind the auditive aperture, and situated obliquely on the neck, is a slight fold of the skin.

The neck is somewhat contracted, the body slender and depressed, with the back, however, slightly arched, and the belly flat. The tail, as already mentioned, is quite long and slender, depressed at its base, and hence conical towards the tip.

The fore-legs, when stretched backwards along the sides, extend nearly to the groin, while the hind-legs, when brought forwards, reach almost to the ear.

The scales are imbricated and keeled on the back and sides. Their general shape is that of a lozenge, terminated posteriorly by an acute spine. There are ten longitudinal rows along the back, with five on each side, which are somewhat oblique, and smaller. Underneath, the scales are smooth, posteriorly tricuspid on the belly, whilst under the head and throat they have but two posterior spines. The scales below as well as above the fore-legs are keeled. Those on the upper part of the hind-legs are also keeled, whilst on the thighs they are smooth. The fingers and toes are surrounded with carinated scales to their very tips.

The femoral pores, thirteen or fourteen in number on each side, are conspicuous and situated in the middle of one single small plate.

The black spots in the series along the back are comparatively small, and separated from each other by a space greater than their diameters. The yellow stripe extends from the origin of the neck to beyond the anus, the black from above the shoulder to the groin. The blue patch is elongated and narrow, terminated posteriorly by a black stripe which runs for a little distance along the thigh. There is an elongated black spot on the shoulder.

One specimen was collected on the 6th of June.

Plate X, fig. 5, represents the species in profile and of the natural size.

Fig. 6. The side of the head enlarged, to show more distinctly the structure of its plates.

Fig. 7. Head from above, enlarged in the same proportion as fig. 6.

Fig. 8. Head from below, enlarged.

Fig. 9. The right arm and fingers, seen from below.

Fig. 10. The right leg and toes, seen from below.

Fig. 11. Dorsal scales, enlarged four times.

Fig. 12. Scales from the belly, slightly enlarged.

V. CNEMIDOPHORUS, Wagl.

This genus is characterized by a bifid tongue; a double transverse fold of skin under the throat; teeth on the palate; maxillary teeth compressed, the posterior one tricuspid; femoral pores; broad plates under the thighs; fingers not carinated underneath; and a subcylindrical, very long and tapering tail. The body above is covered with minutely crowded scales; whilst on the belly there are eight longitudinal rows of subquadrangular, transversely elongated plates, or scutellæ. On the tail the scales are quite large and very conspicuous, strongly carinated and constituting circular rows or whorls.

The explorations of the last few years in Texas and New Mexico have brought to light several other species of the genus *Cnemidophorus*, all provided with eight longitudinal rows of abdominal scutellæ. These are *C. gracilis*, from the desert of the Colorado; *C. perplexus*, from the upper valley of the Rio Grande; *C. gularis*, *C. Grahamii*, and *C. marmoratus*, from different localities in Texas.

The discovery of *C. gularis* in Arkansas is an interesting fact in regard to its geographical distribution.

5. Cnemidophorus gularis, B. & G.

Zoology, Pl. X, fig. 1–4.

Spec. char.—Ground color brownish, with six longitudinal stripes, green or yellow; beneath yellowish white, unicolor. Scales on the subguttural fold quite large and conspicuous in proportion to those in other species.

Syn.—*Cnemidophorus gularis*, B. & G. Proc. Acad. Nat. Sci. Philad., vi, 1852, 128.

Desc.—This species is very closely allied to *C. sexlineatus*, having, like the latter, six longitudinal stripes, three on each side of the body, running from head to some distance along the tail. It has, also, the same general form; but on a close comparison it will soon be observed that the body is proportionally shorter, the limbs more developed, whilst the scales on the back appear to be actually larger. The head is proportionally smaller and narrower. But the most striking organic character consists in the presence of somewhat large and conspicuous scales on the margin of the subguttural fold of the skin. The following indications of color are derived from the notes of the Expedition: The upper surface of the head is reddish brown; three longitudinal yellow or greenish stripes extending from the head to the origin of the tail; the middle stripe on each side may be followed on the tail to a considerable distance. The dorsal space between the two uppermost stripes on each side is brown, or reddish brown, like the head above. The space between the uppermost and middle stripes is of a deep black, and extends from the upper angle of the orbit down to a certain distance along the tail. The space between the middle and lower stripes, and between the latter and the abdominal scutellæ, is green, or greenish brown. The legs are brownish red, and the belly white or bluish white. The tail underneath is yellowish red; above, brownish, or reddish brown.

Specimens were collected on the 5th and 6th of June.

Plate X, fig. 1, represents *Cnemidophorus gularis* of natural size.

Fig. 2. Head seen from above, to exhibit the plates.

Fig. 3 shows the scales on the subguttural fold and the hand from beneath, as well as the submaxillary plates.

Fig. 4 represents the femoral pores, the preanal plates, and also the plates at the inferior surface of the hind-legs, and the lower surface of the feet.

VI. LYGOSOMA, Gray.

This genus includes small scincoid lizards, the nostrils of which open in one single plate, the nasal. The supranasals are wanting. The palate is without teeth, and provided with a triangular notch situated far back. The scales, broader than long, are all smooth.

All the species of *Lygosoma* belong to the Old World, except the one here mentioned.

6. LYGOSOMA LATERALIS, Dum. and B.

SPEC. CHAR.—Upper part of head and body chestnut-brown; a black lateral band extending from the snout across the eye to a considerable distance along the tail. Flanks grayish-brown, with longitudinal indistinct, darker, interrupted vittæ. Abdomen yellowish, and tail beneath bluish; circumference of scales mottled with gray. Tail longer than the body. Limbs very small.

SYN.—*Scincus lateralis*, Say, in Long's Exp. Rock. Mts. II, 1823, 324.—Harl. Jour. Acad. Nat. Sc., V, 1827, 221, and VI, 1829, 12.—Holbr. N. Amer. Herp., first ed., I, 1836, 71. Pl. viii.

Scincus unicolor, Harl. Journ. Acad. Nat. Sc. Philad., V. i, 1825, 156.

Tiliqua lateralis, Gray, Syn. Rept., in Griff. Anim. Kingd., Cuv. IX, 1831, 70.

Lygosoma lateralis, Dum. and B., Erp. gen. V, 1839, 719. Holb. N. Amer. Herp, second ed., II, 1842, 133. Pl. xix.

This small and graceful species appears to be spread over a large portion of the United States. It is always met with running on the surface of the ground in forests, among dead leaves, never ascending either trees or shrubs like many other lizards.

The body is sub-quadrangular, the head continuous with it, and, like it, flattened above. The tail is sub-circular, tapering into a point. The plates of the head correspond with the descriptions which we have before us, except that the frontonasals are not contiguous, but separated by a small odd plate directly in advance of the vertical (sometimes called frontal). But this peculiarity of structure is not indicative of any specific difference.

The auditive apertures are large, circular, and their margin simple. The fore-legs, when extended forward, reach the eye. The hind-legs are a little longer and stouter than the fore-legs. The scales are perfectly smooth, uniform above and below, and disposed in thirty longitudinal rows around the body. The two middle preanal scutellæ considerably larger.

One specimen was procured near the mouth of Cache creek, on the 16th of May.

BATRACHIANS.

Of this order of reptiles only two species were procured—a toad and a frog.

1. Bufo cognatus, Say.

Zoology, Pl. XI.

Spec. char.—Greenish brown above, with a lighter yellowish dorsal line. Patches of blackish-brown scattered over the sides and legs. Beneath unicolor of a dingy yellow. Head short, groove on its upper surface, not extending to the anterior rim of the eye.

Syn.—*Bufo cognatus*, Say, in Long's Exp. to Rock. Mts. II, 1823, 190.

Obs.—It is not without hesitation that we have referred the present species to *Bufo cognatus;* the description of Say as cited is exceedingly brief, applying almost equally well to several allied species. The colors of our specimen vary considerably from the *B. cognatus* as described by Say; but the characters of the groove of the crown agree better. The mark of "head with a groove which hardly extends anteriorly to the line of the anterior canthus of the eye," although not strictly in accordance with our species, may, with some allowance, be made to answer to it. It is much to be regretted that the original specimen of Say was destroyed in the conflagration of the Philadelphia Museum, and thus all hopes of identification are lost. If, however, further explorations in Arkansas should yield many additional specimens, all differing as much as the present from Say's description, it will become necessary to assign a new name to it, especially if the true *B. cognatus* be at the same time detected.

Description.—The head is very short, the snout obtuse and truncate, with the nostrils subterminal. Upper surface of head grooved; groove subelliptical and short, not extending anteriorly to the anterior rim of the eye (fig. 2). The superciliary ridges thicken from before backwards, extending to the tympanum in passing obliquely behind the eyes, and in contact also with the parotid glands, which are subovoidal and of medium size. Tympanum rather small, subelliptical; its longest diameter almost vertical. The fore and hind legs are well proportioned to the size of the body. The under surface of the hand is provided with small crowded tubercles, a more conspicuous and a larger one at the articulations of the fingers; the fingers themselves are depressed or

flattened. A larger disc-like knob is observed on the middle and at the base of the hand (fig. 3).

The toes (fig. 4) are but slightly webbed, and, like the fingers, depressed. The fourth is conspicuously the longest, and the third a little longer than the fifth. The under surface of the feet (fig. 5) is covered with smaller tubercles than those of the hands. A large spade-like process exists at the base of the first or inner toe, exteriorly to which, and at the base still of the metatarsus, is a small knob-like tubercle. The body is thickly covered with papillæ, with some large ones more conspicuous along the sides of the back; on the flanks they are smaller, similar to those of the intervening spaces on the back; on the abdomen the papillae are smaller still; upper part of hands and feet minutely granulated. The snout alone is smooth.

The dark patches scattered over the upper part of the animal are margined with a light yellowish line. Sinuating yellowish lines may be observed on the sides of the belly, or flanks and legs. A rather large spot is seen beneath the eye, and another in advance and beneath the tympanum near the angle of the mouth.

One specimen procured near the Water-hole between Camps 6 and 7.

Plate XI, fig. 1, represents *Bufo cognatus* of natural size.

Fig. 2. The head from above.

Fig. 3. Left hand seen from below.

Fig. 4. Right foot from above.

Fig. 5. Right foot from below.

2. Rana pipiens, Latr.—Bullfrog.

Spec. char.—Toes webbed to their extremity, fourth toe one fourth longer than the third and fifth. An elongated tubercle at the base of the first toe; sub-articular tubercles of fingers and toes but slightly developed. Vomerine teeth on two rounded and separated elevations situated between the internal nostrils. Diameter of tympanum (in the specimen before us) greater than the diameter of the eye.

Syn.—*Rana pipiens*, Latr. Hist. Nat. Rept. II, 1802, 153. Harl. Amer. Jour. Sc. X, 62. Med. & Phys. Res., 1835, 101; and Jour. Acad. Nat. Sc. Philad. V, 1827, 335. Holbr. N. Amer. Herp. IV, 1842, 77. Pl. xviii.

Rana mugiens, Merr. Tent. Syst. Amph. 1820, 175. Dum. & B. Erp. gen. VIII, 1841, 370.

The bullfrog is quite a common animal in the United States, though its northern, western, and southern limits are not yet accurately known.

A large specimen was found in a cold spring near the head of the south fork of Cache creek, in the Witchita mountains. The upper parts of body and limbs are covered with warty eminences, more crowded on the body. These warts are perfectly smooth, like the skin itself. The ground-color is greenish brown above, with crowded deep brown or blackish spots. Beneath, dull yellow, with clouded bluish patches. The lower surface of the feet has the same marmorated appearance as the back. The jaws and snout are greenish brown, and perfectly smooth.

The specimen before us is remarkable for the size of its tympanum, which is much larger than the eye.

FISHES.

BY S. F. BAIRD AND C. GIRARD.

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1. POMOTIS LONGULUS, B. & G.

ZOOLOGY, PL. XII.

SPEC. CHAR.—General form elongated. Opercular flap rather small and entirely black. Twenty-seven to twenty-nine rows of scales across the line of greatest depth of body, and about thirteen rows on the tail. Fifty-two scales in the lateral line.

SYN.—*Pomotis longulus*, B. & G. Proc. Acad. Nat. Sc. Philad. VI, 1853, 391.

DESCRIPTION.—The body is very much compressed, and more elongated than usual in the genus *Pomotis*—so much so, indeed, as to resemble *Grystes* even more than *Centrarchus*. The head constitutes a little less than the third of the total length, including the caudal fin; it is subconical, with a little depression upon the middle of the skull. The eyes are large and circular, and their diameter is contained five times in the length of the head measured from the tip of the snout to the extremity of the opercular flap. The posterior extremity of the maxillary reaches a point opposite the middle of the pupil. The cheeks are densely covered with small and imbricated scales. The largest scales are on the opercular apparatus (the preopercular excepted), where they are also imbricated. The opercular is subtriangular; its upper angles rounded, and the posterior one terminated by a membranous and rather small flap, entirely black. The subopercular extends along the inferior edge of the opercular, tapering slightly upwards. The interopercular forms a regular curve immediately beneath the preopercular, and is covered with one row of scales, there being a double row of these upon the subopercular.

The dorsal fin is rather low, especially its spiny portion. Its anterior margin is exactly opposite to the opercular flap. There are ten spiny rays and nine soft ones, the last being double and the shortest. The first, second, third, fourth, fifth, and sixth rays increase gradually in length in the order enumerated; the eighth is equal to the sixth; the ninth is the

longest. They all (the soft rays) bifurcate from their middle, and then again subdivide from four-fifths of their length to the tip. The caudal fin is subcrescentic posteriorly; its angles are rounded; its length contained five times and a half in that of the body and head together. The central rays bifurcate three times upon their length. There are seventeen rays in all, with a few rudimentary ones. The anal is well developed; its three anterior spiny rays are the shortest, and not very conspicuous. The eight remaining ones are soft and articulated; similar in structure to those of the dorsal fin. The ventrals are inserted behind the base of the pectorals; their tip, when bent backwards, reaching the anus, which is situated a quarter of an inch in advance of the anterior margin of the anal fin. This is subtriangular, posteriorly subtruncated, composed of an anterior spiny ray and five soft and articulated ones, which bifurcate twice. The pectoral extends backwards as far as the ventrals. Its rays, fifteen in number, are all soft and very slender, bifurcating twice. Only thirteen of these rays are well developed. The formula of the fins is as follows:

D X. 9 + 1; A III. 8; C 2. I. 8. 7. I. 1; V I. 5; P 15.

The scales are of medium size, longer than high, truncated anteriorly, rounded posteriorly, and finely denticulated, as seen in fig. 4. The lateral line does not extend beyond the insertion of the rays of the caudal, the base of which is covered with scales irregularly disposed. The smallest scales are observed under the head, upon the throat; the largest on the peduncle of the tail.

The color is not sufficiently preserved in the single specimen collected to admit of description. Traces of irregular lines are, however, visible upon the cheeks and opercular apparatus.

Found in Otter creek, Arkansas.

Plate XII, fig. 1. *Pomotis longulus*, in profile and of the size of life.

Fig. 2. A dorsal scale taken on the middle of the back, above the lateral line.

Fig. 3. A scale from the lateral line, exhibiting the mucous tube.

Fig. 4. A scale from the sides of the abdomen, below the lateral line.

Figs. 2–4 are magnified twelve times.

2. Pomotis breviceps, B. & G.

Zoology, Pl. XIII.

Spec. char.—General form short and stout, subelliptical; opercular flap very much developed and directed upwards, black with a lighter margin. Twenty-four rows of scales across the line of greatest depth,

and twelve rows on the peduncle of the tail. Thirty-seven scales on the lateral line.

Syn.—*Pomotis breviceps*, B. & G. Proc. Acad. Nat. Sc. Philad. VI, 1853, 309.

Description.—The abbreviated head constitutes two-sevenths of the entire length, the caudal fin included. Middle of the cranium slightly depressed. Nostrils nearer to the eye than to the tip of the snout. Eyes of medium size and circular; their diameter is contained four times only in the length of the head from the snout to the base of insertion of the opercular flap, which is longer than a diameter of the eye. The mouth is proportionally small; the posterior extremity of the maxillary not extending as far back as the middle of the pupil. The teeth are slenderer and more conspicuous than in *Pomotis longulus*. Cheeks covered with scales, but slightly smaller than those on the opercular apparatus. The opercular bones have the same general shape as in *Pomotis longulus;* but the opercular flap is very much developed, longer than broad, and rounded posteriorly. The structure of this flap is somewhat similar to a fin; slender and simple rays being distinctly visible through the membrane.

The dorsal fin commences in a line above the base of the opercular flap. Its spinous portion is almost as elevated as the soft one. There are eleven spinous rays, the first and second smallest; and ten articulated or soft ones, occupying a little more than half the space as the spines. The structure of the soft rays and their relative length are much as in *Pomotis longulus;* they bifurcate from the middle of their length, and subdivide again upon their extremity. The caudal is subcrescentic posteriorly, and its angles rounded. It is composed of seventeen well developed rays, and a few rudimentary ones. The central rays bifurcate three times. The anal fin is composed of nine soft rays, one more than in *P. longulus*, and three spinous ones; the second and third almost equal in length. They bifurcate and divide in the same manner as the dorsal. The insertion of the ventrals is immediately behind the base of the pectorals. Their shape is triangular, and when bent backwards their tip extends to the anterior margin of the anal fin, thus overlapping the anus, which is situated as in *P. longulus*, about a quarter of an inch in advance of the anterior margin of the anal fin. The ventrals are composed of one spinous and five articulated rays, which bifurcate three times. The insertion of the pectorals is subcrescentic; the tip of these fins reaches about as far back as do the ventrals. The rays, fourteen in number (thirteen of them well developed), are slender

and show traces of a bifurcation of the third degree upon their extremity.

D XI. 10; A III. 9; C 2. I. 8. 7. I. 2; V I. 5; P 14.

The scales are proportionally large, higher than long, subtruncated anteriorly, and rounded posteriorly with minute denticulations. Scales irregularly disposed, exist on the base of the caudal. The largest scales are seen on the middle of the flanks, and the smallest upon the subthoracic region. The ground-color appears to have been of a uniform reddish brown. The opercular flap is deep black, margined with a lighter line, the hue of which is not preserved. There are several sinuous irregular lines upon the cheeks and opercular apparatus.

This species has a general resemblance to *Pomotis nietidus*, Kirt., but may easily be distinguished by prominent characters.

One specimen was caught in Otter creek, Arkansas.

Plate XIII, *Pomotis breviceps* of natural size.

Fig. 2. A dorsal scale.

Fig. 3. A scale from the lateral line.

Fig. 4. A scale from the sides of the belly.

Figs. 2–4 are enlarged twelve times.

3. Leuciscus vigilax, B. & G.*

Zoology, Pl. XIV, figs. 1–4.

Spec. char.—Subfusiform. Dorsal fin longer than high. Sixteen rows of scales across the line of greatest depth, and eight on the peduncle of the tail. Thirty-eight to forty scales in the lateral line, which runs through the middle of the sides, slightly bent downwards on the abdomen.

Syn.—*Ceratichthys vigilax*, B. & G. Proc. Acad. Nat. Sc. Philad. VI, 1853, 391.

Description.—Body subfusiform, compressed. The head forms one-fifth of the entire length from the snout to the tip of the caudal fin; it is contained three times in the length of the body, the caudal fin being about one-fifth of the entire length. The head itself has the shape of a truncated cone. The eyes are subelliptical; their longitudi-

* Note.—Owing to the immature state of the specimens, we have preferred returning this species to the genus *Leuciscus*. Although having a strong resemblance to *Ceratichthys*, as also to *Pimephales*, in the bluntness of the snout, the inferior position of the mouth, and other characters, yet the specimen is almost too small to allow a final determination as to its generic character.

nal diameter being contained three times and a half in the length of the sides of the head. The mouth is rather small, its angle not extending to a point below the anterior rim of the eyes. The opercular bone is conspicuously large, and almost trapezoidal in shape. The subopercular and preopercular are comparatively small. The isthmus beneath is about three-tenths of an inch wide.

The dorsal fin is longer than high, and is composed of nine rays, bifurcated from about their middle; some of the median rays showing another subdivision upon their extremity. The caudal fin is forked; its angles are acute. It contains eighteen well developed rays, and several rudimentary ones above and below; the central ones bifurcate twice. The base of the caudal fin is considerably broader (higher) than the central portion of the peduncle of the tail. The anal fin is situated behind the dorsal, is higher than long, subtrapezoidal, and composed of eight bifurcated rays; the central ones subdivided towards their extremity. The ventrals are inserted very little behind the anterior margin of the dorsal; they are rather slender, posteriorly rounded, composed of eight bifurcated rays, the middle ones bifurcated towards their extremity; and when bent backwards the fin does not reach quite to the anus, which is situated immediately in advance of the anterior margin of the anal fin. The pectorals are slender; when bent backwards they do not reach the insertion of the ventrals. They are composed of fourteen bifurcated rays, the central ones subdividing at their last third. Formula:

D 9; A 8; C 3. I. 8. 8. I. 3; V 8; P 14.

The scales are proportionally large, a little higher than long, rounded at both extremities, more abruptly posteriorly. The lateral line runs along the middle of the side, slightly bent downwards on the abdomen.

The ground-color is yellowish brown; a blackish stripe composed of crowded dots follows the lateral line on the sides.

One specimen (immature) caught in Otter creek, Arkansas.

Plate XIV, fig. 1, represents *Leuciscus vigilax*, size of life.

Fig. 2. A dorsal scale.

Fig. 3. A scale from the lateral line.

Fig. 4. Abdominal scale.

Figs. 2–4 are enlarged twelve times.

4. Leuciscus bubalinus, B. & G.

Zoology, Pl. XIV, figs. 5–8.

Spec. char.—Compressed. Back arched. Tail slender. Dorsal fin higher than long. Ten rows of scales across the line of greatest depth,

and five rows on the tail. The lateral line, which contains about thirty-six scales, runs below the middle of the flanks. Dorsal, caudal, anal, and ventral fins, well developed.

Syn.—*Leuciscus bubalinus*, B. & G. Proc. Acad. Nat. Sc. Philad. VI, 1853, 391.

Description.—The body much compressed, and rather short in appearance. Back considerably arched in advance of the dorsal, behind which the body tapers quite rapidly posteriorly, rendering the peduncle of the tail comparatively slender. The head is about one-fifth of the entire length. Eyes comparatively large and circular; their diameter contained three times and a half in the length of the head, one diameter intervening between the eye and the snout. The nostrils are nearer to the eyes than to the tip of the snout. The jaws are even, (the figure represents the lower one a little too short). The opercular apparatus is conspicuously developed, especially the opercular, which has the shape of an elongated quadrangle, slightly concave posteriorly, and slightly rounded inferiorly. The isthmus is quite small.

The anterior margin of the dorsal fin corresponds to the middle of the distance between the snout and the base of the caudal fin. It is angular and higher than long, and composed of eight rays. The anal has the same length as the dorsal, but is not quite as high; it is composed of nine articulated rays and two minute spines at the anterior margin. The ventrals when bent backwards reach the anterior margin of the anal fin, consequently overlapping the anus situated close to the anal fin. They contain eight rays, all soft or articulated. The pectorals are comparatively small and slender, reaching the insertion of the ventrals when brought backwards. Their posterior margin is rounded; the rays eleven in number. In all the fins the rays are bifurcated, and the middle ones subdivided upon their length. Formula:

D 8; A II. 9; C 4. I. 9. 9. I. 3; V 8; P 11.

The scales are large, higher than long, rounded anteriorly, subtruncated posteriorly. The lateral line forms a very open curve, convex downwards, and nearer to the insertion of the ventrals than to the base of dorsal.

The ground-color is greyish; the hue is not preserved on the specimen.

Caught, like the preceding, in Otter creek, Arkansas.

Fig. 5 represents *Leuciscus bubalinus* the size of life, and apparently quite mature.

Fig. 6. A dorsal scale.

Fig. 7. Scale from the lateral line.

Fig. 8. Abdominal scale.

Figs. 6–8 are enlarged twelve times.

5. Leuciscus lutrensis, B. & G.

Zoology, Pl. XIV, figs. 9–12.

Spec. char.—Subfusiform, compressed. Insertion of ventrals in advance of dorsal. Twelve rows of scales across the line of greatest depth; six rows on the tail. About thirty-six in the lateral line, which is bent downwards on the abdomen and slightly broken in advance of the anal fin. Dorsal and anal fins well developed.

Syn.—*Leuciscus lutrensis*, B. & G. Proc. Acad. Nat. Sc. Philad. VI, 1853, 391.

Description.—The body is much compressed and subfusiform in general appearance, somewhat tapering from the posterior margin of the dorsal and anal fins to the caudal, the base of which is broader than the peduncle of the tail. The greatest depth is equal to the length of the sides of the head, which is contained three times and a half in the total length, the caudal fin included. The greatest thickness is nearly half of the depth. In general aspect it resembles *Leuciscus kentuckiensis* of Kirtland. The eyes are of medium size, subcircular; their diameter contained four times in the length of the sides of the head. The nostrils, situated towards the upper surface of the head, are nearer to the eyes than to the tip of the snout. The posterior extremity of the maxillary does not reach the vertical of the anterior rim of the orbit.

The upper and posterior margins of the opercular constitute a uniform curve, whilst the anterior and inferior margins are straight, forming a rather acute angle. The subopercular and interopercular are comparatively small.

The anterior margin of the dorsal fin is situated on the middle of the distance between the snout and the base of the caudal; the fin itself is quadrangular, higher than long, and composed of eight rays, the last double, and the anterior rudimentary in close contact with the next. The anal is shaped somewhat like the dorsal; it has nine perfect rays, and an anterior rudimentary one. The caudal is deeply forked with acute angles, and shorter than the head. It is composed of nineteen well developed rays, and several rudimentary ones, above and below. The ventrals are posteriorly rounded, (a character not expressed in the figure,) composed of eight rays, and when bent backwards their tips reach the anus, which is situated immediately in advance of the anal fin. The pectorals are elongated, rather slender, rounded, and their tip

not quite reaching the insertion of the ventrals. They are composed of eleven slender, bifurcated, but not subdivided, rays. The median rays of the dorsal, caudal, anal, and ventrals, are subdivided for at least one-fourth of their length, the bifurcation beginning sometimes upon their middle. Formula:

D 8 + 1; A 1. 9; C 2. I. 9. 8. I. 1; V 8; P 11.

The scales are proportionally large, higher than long; anterior, superior, and inferior margins, uniformly rounded, posteriorly subtruncated. The lateral line is considerably bent down on the abdomen, and slightly broken in advance of the anal fin.

The ground-color, as preserved in alcohol, is dull bluish brown; the back is bluish; the dorsal fin yellowish brown; the caudal, pectorals, and ventrals, are reddish.

Several specimens were caught in Otter creek, Arkansas; the largest of which we have had figured.

Plate XIV, fig. 9, *Leuciscus lutrensis* size of life.

Fig. 10. A dorsal scale from the middle of the region between the dorsal fin and the lateral line.

Fig. 11. A scale of the lateral line taken beneath the dorsal fin.

Fig. 12. An abdominal scale taken beneath the lateral line, half way between the latter and the line of the belly.

SHELLS.

BY PROFESSOR C. B. ADAMS.

AMHERST, MASSACHUSETTS,
December 1, 1852.

DEAR SIR: I transmit herewith a list of the shells which were collected in Texas and upon Red river, by Captain Marcy;

And have the honor to remain, your obedient servant,

C. B. ADAMS.

President HITCHCOCK.

ACEPHALA.

1. UNIO ASPERRIMUS, Lea.

The specimens have a great profusion of small tubercles on the umbones. One large specimen was taken May 22d, at the foot of the Witchita mountains; 3 mature and 5 young shells were taken in Otter creek, July 13th, near the same place; long. about 100° W.; lat. about 34° 35′ N.

2. UNIO, Sp. indet.

This may be a variety of the preceding; but with only one decayed specimen, we do not venture to describe it as a new species. It differs in having only a few large tubercles in two radiant series, of which one passes down the middle of the disc, and the other is on the posterior angle. A few small curved ridges proceed from this angle to the ligamentary margin. No label.

3. UNIO TUBERCULATUS, Barnes.

A single valve of a young specimen; no label.

4. Unio anodontoides, Lea.

7 specimens were taken in Otter creek July 13th; one of them is 5 inches long, 2 to 3 inches high, and 1.6 inch wide.

5. Unio parvus, Barnes.

2½ specimens were taken in Otter creek July 13th.

6. Unio hydianus, Lea.

2 specimens were taken near Fort Washita July 31st.

7. Unio lævissimus, Lea.

The specimen is for this species remarkably thick; the nacre is deeply colored with reddish-purple, and there are some fine radiating striæ behind the umbones. No label, but may have been taken in Otter creek, since it was in the same parcel with the next species.

8. Unio gracilis, Barnes.

Several specimens were taken in Otter creek July 13th, and some July 15th, probably in a branch of Cache creek, a few miles west of Otter creek.

9. Cyclas distorta, Prime.

4½ specimens were taken in Otter creek July 13th.

GASTEROPODA.

10. Bulimus liquabilis, Reeve.

4 specimens (dead) were taken in Otter creek July 13th. This is the only terrestrial species in the collection.

11. Physa ancillaria, Say.

3 specimens were taken in Otter creek July 13th. They are more shouldered than is usual, but not so much as the variety figured by Professor Haldeman, Monog. Physa, pl. 3, fig. 5.

12. PHYSA HETEROSTROPHA, Say.

12 specimens were taken in Otter creek July 13th.

13. LYMNÆA CAPERATA, Say.

2 specimens were taken May 16th, one day from Cache creek.

14. PLANORBIS LENTUS, Say.

Several specimens were taken with the preceding; also in Otter creek, July 13th.

Geographical Distribution.

Nos. 3, 11, 12, and 13 occur also through the western and eastern States. No. 8 has its northeastern limit in Lake Champlain. Although Ohio specimens of this species are easily distinguished from those of Lake Champlain, it is remarkable that these Texan shells cannot be distinguished from them. Nos. 5, 6, and 14 are southern species. No. 10 has hitherto been known only as a Texan shell. The remainder are western and southern species.

NOTICES OF ADDITIONAL SPECIES OF SHELLS: BY G. C. SHUMARD, M. D.

1. UNIO ANODONTOIDES, Lea.

Found in the Little Witchita, and in a small creek between Fort Washita and Fort Arbuckle; quite abundant, and the specimens very beautiful.

2. UNIO RUGOSUS, Barnes.

Occurs with the preceding species at all the localities above mentioned. The specimens are less ventricose than any we have seen from the Ohio basin. They approach more nearly to a variety brought by Prof. Litton from Red river of the north.

3. Unio siliquoideus, Barnes.

Found in a small creek between Fort Arbuckle and Fort Washita.

4. Unio lævissimus, Lea.

A few detached valves of this species were found on the banks of Otter creek.

5. Anodonta imbecilis, Say.

Abundant, and very beautiful, in Beaver creek; more sparingly in a small creek between Fort Arbuckle and Fort Washita.

6. Planorbis trivolvis, Say.

Abundant in many of the streams from Fort Belknap to the sources of Red river.

7. Physa gyrina, Say,

Beaver creek, Choctaw Nation.

8. Succinea avara, Say.

Otter creek, Choctaw Nation.

9. Cyclas partumeia, Say.

Otter and Beaver creeks.

10. Bulimus dealbata, Say.

Texas.

ORTHOPTEROUS INSECTS.

BY CHARLES GIRARD.

I. DAIHINIA, Hald.

Gen. char.—Body rather short, concave above, without any traces of wings; provided with short and robust limbs; second and third nts of tarsi, equal; antennæ long and filiform. A row of spines upon the under surface of the femora, more conspicuous in males than in females.

Syn.—*Daihinia*, Hald. Proc. Amer. Assoc. Adv. Sc. II, 1850, 346.

Obs.—The general aspect of this genus is that of *Phalangopsis*, from which it differs by having "shorter antennæ, shorter and more robust limbs." It approximates to *Stenopelmatus* by the structure of its tarsi, in which the second and third joints are equal.

Prof. Haldeman, who traced the distinction between *Daihinia* and *Phalangopsis*, proposed to consider the former as a mere sub-genus of the latter. But should the above character prove constant, they are sufficient to raise *Daihinia* to the rank of a genus; thus simplifying much the nomenclature.

Two species of this genus are known—the one herein described and figured, and *D. robusta*, Hald., an inhabitant of New Mexico.

1. Daihinia brevipes, Hald.

Zoology, Pl. XV, figs. 9-13.

Spec. char.—Dark brown, mottled with lighter shades; legs short and robust; tibiæ shorter than the femora, and strongly spinous; antennæ of medium development.

Syn.—*Phalangopsis* (*Daihinia*) *brevipes*, Hald. Proc. Amer. Assoc. Adv. Sc. II, 1850, 346.

Description.—The fact that in this species the tibiæ are shorter than the femora, contributes somewhat to impress upon it more strongly that character of the genus which consists in being provided with

shorter limbs than in *Phalangopsis*. The surface of the body is generally smooth, but posteriorly, and particularly in the male, there are minute short spines, which give to that region a granulated appearance; these minute spines are especially crowded upon the margin of the segments or articulations. The femora are provided with spines above and below, stronger below, and more so in the male. The tibial spines are very much developed on the anterior and posterior tibiæ, much less on the medial ones; anteriorly they occupy the outer edge of the limbs, and answer fossorial purposes; posteriorly they constitute two rows, directed horizontally backwards, inclining a little downwards, the inner row being the strongest. The anterior and posterior tarsi are trimerous; the medial ones being tetramerous. The ovipositor is comparatively small; its length being less than the half of the length of the body, and provided beneath and towards the tip with from eight to ten small spines.

The ground-color is chestnut-brown, mottled above with lighter shades. The antennæ and spines are blackish.

Specimens were collected at the Camp No. 7, recorded as "yellowish-brown;" others on June 5th and 6th, said to be "yellowish-red."

Plate XV, fig. 9, represents the male *Daihinia brevipes* size of life.

Fig. 10 is the female, also the size of life.

Fig. 11, front view of the head of the female.

Fig. 12, a tarsus from above.

Fig. 13, a tarsus from below.

II. ANABRUS, Hald.

Gen. char.—Body sub-cylindrical, thickest in the middle; without wings; antennæ almost as long as the body, and filiform; pronotum selliform, extending over the basal articulation of the abdomen, and concealing rudimentary elytra; ovipositor elongated, nearly straight, sword-shaped; tarsi broad, soles concave; third articulation cordate.

Syn.—*Anabrus*, Hald. in Stansb. Expl. Vall. G. Salt Lake, 1852, App. C, 370.

Obs.—The general appearance of the genus *Anabrus* reminds us strongly of *Phalangopsis* proper, from which it is distinguished by its movable and selliform pronotum and the length and shape of the ovipositor. The general proportions of the body and limbs are more elongated than in *Phalangopsis*. The structure of the tarsi, which is

not apparent upon a first glance, affords other differences not less important, between *Anabrus* and *Phalangopsis*, when studied comparatively.

2. Anabrus haldemanii, Girard.

Zoology, Pl. XV, figs. 5–8.

Spec. char.—Antennæ long and filiform, reaching posteriorly the base of the ovipositor; pronotum short, broad; femora smooth. Yellowish; feet and ovipositor reddish purple. Posterior margin of pronotum black, with two parallel black bands on the posterior third of its length.

Description.—The abdomen above exhibits ten segments or articulations; the anterior or basal one being, as stated above, covered by the posterior prolongation of the pronotum. Beneath there are seven subquadrangular plates, situated opposite to the seven middle upper segments. The posterior segments enclose another piece bearing two spine-like abdominal appendages—one on each side. The ovipositor is as long as the abdomen, and entirely smooth. The base of the antennæ is situated above the eyes, and inserted upon an angular movable piece. The joints composing these organs are very short, and provided with minute setæ. The tibiæ are provided with four rows of spines, two anterior and two posterior; the internal posterior row being the stoutest. The posterior rows are more densely set with spines, whilst the latter are scattered and alternate with each other in the anterior rows. The first and cordate joint of the tarsi is the longest; the second is the shortest; and from the middle of the third, a fourth slender and long joint arises, slightly convex above, and terminating in two spines or claws curved inwards and outwards.

The ground-color above and below is yellowish; the antennæ, limbs, and ovipositor are of a reddish purple. The posterior margin of the pronotum is black. Two parallel black vittæ, enclosing a narrow yellow one, are observed on each side of the dorsal line, upon the posterior third of the pronotum. The posterior portion of the upper abdominal segments is occasionally of a deep-brown hue.

This species differs from *Anabrus simplex*, Hald., by a proportionally much shorter pronotum.

One specimen, caught June 27th, is recorded as "green and white."

Plate XV, fig. 5, represents *Anabrus haldemanii* in a profile view and of the size of life.

Fig. 6 is a front view of the head.

Fig. 7, a tarsus from above.

Fig. 8, a tarsus from below.

III. BRACHYPEPLUS, Charp.

Gen. char.—Body acrydoid; elytra and wings rudimentary; antennæ rather short; pronotum tricarinated; surface between the carinæ granulated. Second joint of tarsi very short; first and third elongated; last one terminating by two curved claws, between which is situated a sub-circular fleshy disk.

Syn.—*Brachypeplus*, Charp. Orth. descr. et pict. Fasc. IX, 1843, Tab. li.

Obs.—This genus, established by Toussaint de Charpentier in his *Orthoptera descripta et picta*, was not characterized, owing, perhaps, to the fact that one species only was known and described by him under the name of *B. virescens*, said to inhabit "Mexico." It may easily be distinguished from the one we shall describe by its much shorter antennæ and slenderer tarsi; also by its color, which is deep-green, with a few brown spots on the pronotum, and a double series of these along the upper part of the abdomen.

3. Brachypeplus magnus, Girard.

Zoology, Pl. XV, fig. 1–4.

Spec. char.—Reddish brown; elytra dotted with black; antennæ bluish brown; femora and tibiæ reddish; tarsi purplish; spines black towards tip; femora sub-fusiform; a carina along the upper and middle region of the abdomen.

Description.—The pronotum is one-third of the length of the abdomen, overlapping posteriorly the anterior abdominal segment entirely and half of the second. The entire number of abdominal segments or articulations is eleven, carinated upon their medial line, and continuing the medial carina of the pronotum all along the middle region of the abdomen above. Antennæ a little longer than the pronotum, and composed of about twenty short joints. The tibiæ are shorter than the femora, and provided, the two anterior pairs internally, and the posterior pair externally, with two rows of spines, the inner row the strongest. The femora are sub-fusiform; the posterior ones a little broader than thick, but never as much compressed as in *B. virescens*, in which these organs present sharp edges. The tarsi are all tetramerous: the first article is the stoutest and the longest, the second being quite short;

the third is more slender, and the fourth the smallest, terminating into two curved spines or claws, between which is a subcircular fleshy disk. The rudimentary elytra are subovoidal, not extending backwards to the posterior margin of the third abdominal segment.

The ground-color, as preserved upon specimens in alcohol, is yellowish brown; black dots and spots are scattered over the rudimentary elytra. The antennæ are bluish brown; the femora and tibiæ reddish, and the tarsi purplish, whilst the spines are black.

This species differs from *B. virescens* by its proportionally longer antennæ, shorter pronotum, and less compressed femora. The general shape of the body is in every respect proportionally longer than in the latter species.

Two specimens were collected on the 7th of July—one "green," the other "reddish brown."

Plate XV, fig. 1, represents *Brachypeplus magnus* in natural size.

Fig. 2, front view of the head.

Fig. 3, a tarsus from above.

Fig. 4, same from below.

We refer to *Brachypeplus virescens* two specimens; one collected on the 12th of June, and which was "green above, white beneath, with yellow and black stripes on the back;" another specimen, a little smaller, caught June 21st, was "green and brown."

ARACHNIDIANS.

BY CHARLES GIRARD.

I. ARANEIDÆ.

1. Mygale hentzii, Girard.

Zoology, Pl. XVI, 1–3.

Spec. char.—Blackish brown; densely studded with hairs. Cephalothorax subcircular, with a median and transversely elliptical infundibulum upon its posterior half, whence shallow grooves radiate towards the periphery. Abdomen ovoid. Palpi composed of five joints besides the maxillæ, a hook in the male. Legs six-jointed.

Description.—This species is one of the largest of the genus hitherto found within the limits of the United States. The specimen figured, however, is much below the usual size. The cephalothorax is subcircular in shape, a little broader in the male than in the female. The eyes are disposed as in fig. 3, on a little eminence near the anterior margin, and upon the midial line. On the posterior half of the same region, on a line with the eyes, is a transverse infundibulum, sometimes subcrescentic, convex posteriorly. Shallow and sometimes irregular grooves radiate from that centre towards the margin of the cephalothorax. The abdomen is ovoid; considerably larger in the female than in the male. The labrum is quite small. The cheliceræ are robust, regularly arched, terminated by a rather slender hook, similarly curved, and movable upon the cheliceræ. The palpi are six-jointed; the basal joint, functioning as maxilla, is robust, and not otherwise distinguished from the following, except that it is provided along its inner margin with a brush-like series of hairs. The second joint is very short; the third is the longest; the fourth is a little larger than the second; the fifth a little shorter than the third; the fourth shorter than the fifth; the sixth is the size of the second, but differently shaped, being rounded at its extremity, at the inferior surface of which exists a hook, very stout at the base, tapering into an acute point curved downwards and outwards. In the female the sixth joint of the palpi is as long and of the same shape as the fifth, and deprived of the hook. The fourth pair of legs is the longest; the first pair comes next; the second pair is the smallest. They are all six-jointed, the first joint short and robust.

The second joint is the longest; the third the smallest; the fifth is, after the second, the next in length; then the fourth, and finally the sixth. The external pair of fusi, or spinning apparatus, is slender, and, as usual, three-jointed; the internal pair is very small, and not conspicuous. The whole surface of the body and legs, above and below, is densely covered with fine setose hairs. The color is uniform blackish brown.

The *Mygale hentzii* is the large black spider known in the Southwest as the tarantula, where its bite is greatly dreaded.

A female specimen was collected on the 17th of May, on an open, barren prairie between Camps 2 and 3. Other specimens of both sexes were taken on the 28th of June, near the head of south fork of Red river.

Plate XVI, fig. 1 represents *Mygale hentzii* seen from above. Fig. 2 is an underview to exhibit the labrum (l), the maxillæ (m), the cheliceræ (c), and the palpi (p), also to show the fusi (f). Fig. 3 represents the disposition of the ocelli.

2. Lycosa pilosa, Girard.

Zoology, Pl. XVI, figs. 4 and 5.

Spec. char.—Hairs of a yellowish brown color, covering the upper parts. Beneath black; cephalothorax subpyriform; abdomen ovoid. Palpi composed of five joints besides the maxillæ; terminal joint provided beneath with two small spines. Legs very long and slender; all six-jointed.

Description.—Of all the American *Lycosa* hitherto described the present species is the one in which the legs are the longest and the most slender. The size of the cephalothorax and abdomen is proportionally smaller, however, than in *L. fatifera*, Hentz.

The cephalothorax is longer than broad, elevated on its middle region, and anteriorly very prominent; subpyriform in its general outline; the narrowest part directed forwards. Its surface, when freed from its fur, exhibits shallow grooves radiating from the centre towards the periphery, pretty much in the same manner as in the *Mygale* just described, although much less conspicuous. There is no central infundibulum, which is replaced here by a minute longitudinal furrow about a tenth of an inch in length. The abdomen is ovoid, and, as usual, larger in the female than in the male.

The cheliceræ are stout, with a very slight downwards inflexion, provided with small protuberances upon the inner margin of its anterior extremity, and terminated by a slender hook curved inwardly. The

labrum is comparatively small, whilst the maxillæ are stout. The palpi are slender, and composed of five joints. The first joint is very small, inconspicuous; the second is the longest and the most slender of all; the third is somewhat larger than the first, the fourth larger than the third, and the fifth larger than the fourth, which is swollen and subconcave beneath, provided with two minute hooks inserted upon two tubercles. In the female the palpi are slenderer than in the male, and the last joint is simple and longer than the third. The legs are long and slender, composed of six joints: the hind pair is the longest; the first pair is the next in length; the third pair is the shortest. The third joint is the smallest in the four pairs; the first joint is the next in length, and the stoutest; the second pair is the longest in the three anterior pair; the fifth comes next, then the fourth and sixth. In the posterior pair the fifth joint is the longest; then the second; then the fourth and sixth. The fusi, four in number, are short, intimately grouped, and composed of a single joint. The whole surface of the body and legs, above and below, is densely covered with short hairs.

The color above is uniform grayish brown. The abdomen, cephalothorax, and first joint of legs beneath, are deep black. The second, third, and fourth joints are of the color of the upper parts upon their middle, and black near their articulations. The fifth and sixth joints are almost entirely black. The extremity of the cheliceræ and palpi are black beneath. When the hairy covering is removed, the color is a uniform chestnut-brown.

The color may present some variations; thus in the notes of Captain Marcy, one is described as having "the back brown, belly dirty white, head and legs red."

One specimen preserved in alcohol exhibits a reddish band down the middle of the cephalothorax, and two black vittæ, one on each side of the abdomen. The cephalothorax beneath is reddish; and on the abdomen there are two elliptical light spots.

Specimens were collected the 16th of May on the open prairie, between Camps 1 and 2; and on the 19th of June, on Canadian river, Arkansas.

Plate XVI, fig. 4, represents the trophi, showing the labrum (l), the maxillæ (m), the palpi (p), and cheliceræ (c). Fig. 5 exhibits the disposition of the ocelli.

II. TARANTULIDÆ.

Thelyphonus excubitor, Girard.

Zoology, Pl. XVII, fig. 1-4.

Spec. char.—Blackish brown above, deep chestnut beneath; upper surface of body and legs minutely granular; beneath smooth, with scattered minute imprinted dots. First and second articles of the palpi very granular, remaining ones with a few granules and numerous imprinted dots. Caudal appendage very much developed, and composed of about fifty joints.

Description.—There is a very great resemblance between this species and *T. giganteus*.* The only striking difference which exists between them is to be found in the structure of the palpi and in the length of the caudal appendage.

The cephalothorax is elongated, narrowest anteriorly, where it assumes almost a triangular shape. Its posterior margin is subtruncated, slightly concave in the middle. The central portion of the anterior third of the cephalothorax presents a perfectly plane surface, with a medial furrow, as it were; whilst posteriorly it is depressed, and sloping towards the margins, the surface showing shallow depressions, one upon the middle line, and more regular than the lateral ones. Near the anterior extremity, and in a subcircular depression on each side of a medial, smooth, and rounded elevation, are found the ocelli, circular, large and black. In advance of these ocelli, the rostrum is almost abruptly truncated, as seen in the centre of fig. 3. From the anterior ocelli to the lateral ones extends a linear series of granules, terminating upon the tuberculous elevations, upon which are seen three yellowish ocelli grouped, as exhibited in fig. 2.

The cheliceræ are robust, but very slightly bent, composed of one large joint and a conical, curved, and acute spine; to the inner side of which are attached brushes of quite elongated and reddish setæ. Palpi long and robust, in the shape of arms, and composed of six joints. The first joint is seen only from below (fig. 4, a), and exhibits a subtriangular and flat surface, terminated anteriorly by a conical point. The second joint is smaller than the first, scarcely to be seen viewed from below, but developed upon its upper surface into a flattened and irregular disk,

* See *Guérin's* Magazin de Zoologie, 1835, Class VIII, for an illustrated monograph of the genus *Thelyphonus* by H. Lucas.

provided upon its anterior margin with five conical spines, varying in size: seen in front (fig. 3, b), it is elevated almost vertically from the horizontal position of the first. The third joint is the longest of all, slightly curved, and provided inwardly with two minute spines—one above, the other below. The fourth joint is somewhat shorter than the third, but is much longer than broad, subcylindrical, slightly bent, and provided at its inner, anterior, and upper edge, with a prominent, conical, and straight spine. The fifth joint is of the length of the fourth, but slenderer, and provided anteriorly with a stout and shorter spine. Finally, the sixth joint is a subconical and spiny processus, moving against the spine of the fifth joint, constituting a forceps, and used as such to seize prey. The thoracic appendages (feet) are long and slender, especially the anterior and posterior pairs. The anterior pair may be readily distinguished from the three others, in not being provided with hooks upon their extremity. Its function is rather that of a pair of palpi than that of ambulatory organs. The first and second joints are short and stout; the third, fourth, and fifth long and slender; the fourth and fifth almost equal in length, and longer than the third. Eight small joints, together equal in length to the third, terminate these appendages. The three others are constructed upon the same plan, all having nine joints and terminal hooks, generally two in number. The first, second, and third joints are similar to those of the anterior pair; the third, however, is the longest; the fourth is but a little longer though slenderer than the second, and slightly curved; the fifth is much slenderer and a little shorter than the third. Next come four small joints, together smaller in length than the fifth, and provided upon their anterior margin with minute spines. The second of these four, or the seventh in the series, is the longest of the four; the third is the smallest; the first and fourth are equal in length, the latter much slenderer. Two hook-like and slender spines terminate these organs.

The abdomen is longer than the cephalothorax, oval in shape, though depressed, and composed of eight very distinct segments and a half, the anterior one. The stigmatiform bodies are quite conspicuous above (seven pairs), and below (four pairs). The anterior half segment is not seen from below. The seventh segment exhibits laterally a second pair of stigmatiform bodies, less conspicuous, however, than the others. The posterior segment has also faint traces of an analogous pair. The two first caudal rings are very narrow; the third is as large as the two others together. The filiform appendage is very long, and composed of about fifty joints.

The upper surface of the cephalothorax and abdomen is covered with minute granules extending over the palpi, being particularly dense on the three first articles, and over the three first joints of the thoracic appendages also. Minute impunctures are seen upon the remaining articles and joints, and also scattered upon the inferior surface of the appendages and body. Minute setæ are scattered over the appendages of the cephalothorax and abdomen, more densely towards their extremities.

The color is uniform blackish brown above, and deep chestnut beneath.

One specimen of this animal was collected.

Plate XVII, fig. 1, represents, seen from above, *Thelyphonus excubitor* the size of life.

Fig. 2 gives the position, number, and relative size of the ocelli.

Fig. 3 is a front view, exhibiting in the centre the cheliceræ and the three first articles (a, b, c) of the palpi.

Fig. 4 represents the anterior portion of the cephalothorax from below: *a*, first article, *b*, second article, and *c*, third article of the palpi; and *d*, anterior pair of feet.

III. SCORPIONIDÆ.

Although the collections made in the valley of Red river contained no specimens of this group of arachnides, we have brought them here to notice, satisfied as we are that they exist in that locality.

Scorpions are found in the southern Atlantic States, all along the Gulf of Mexico, through Texas and New Mexico to California, and through Louisiana to Arkansas.

1. Scorpio (Telegonus) boreus, Girard.

Zoology, Pl. XVII, figs. 5–7.

Spec. char.—Body greenish yellow; thoracic and caudal appendages yellowish. Lateral ocelli in close contiguity; posterior one the smallest. Median ocelli situated on the sides of an elongated and black elevation. Cheliceræ terminated by a serrated claw. Palpi robust, shorter than the body. Caudal appendage as long as the body, the spine excepted. Abdominal comb with eighteen laminæ.

Description.—The general form of the body is fusiform, anteriorly and posteriorly tapering. The cephalothorax proper is subquadrilateral,

longer than broad, narrower anteriorly than posteriorly; both of these extremities linear; lateral margin somewhat undulated. Its surface is carved with a few undulating grooves, giving to the rest an undulated appearance; and over the whole, minute granules. The median ocelli are black, situated a little in advance of the middle of the length of the thorax, and placed on the sides of an elongated, little, and black eminence, divided longitudinally by a groove. The lateral ocelli are set close together and situated near the anterior margin of the cephalothorax; the posterior one is much the smallest: they are represented with their relative proportions in fig. 7. The cheliceræ are stout, two-jointed; the second being the largest, and is terminated by a minutely serrated claw. The palpi are five-jointed; the first joint is short and stout, and fulfils the function of jaws without denticulation. The second is the smallest. The third and fourth are more elongated; the third a little longer than the fourth. They are angular, the angles being margined with dense rows of minute granules. The fifth joint or hand (carpus) is stout and swollen, exhibiting eight undulating ribs (four above and four below), upon which is a row of minute granules. Two rows above and below are seen extending along the spiny immovable processus of the hand, constituting, with a movable spine, a slender chela or claw, slightly curved inwards. Scattered setæ may be seen on the whole length of the palpi; and also on the thoracic appendages (feet). The latter are slender; the fourth pair is the longest; the first pair the smallest, the second and third pairs being of intermediate proportions; the second longer than the first, and the third longer than the second. They are all flattened, seven-jointed, and terminated by minute hooks. The third joint is in every one the longest and most slender; the fifth, sixth, and seventh are small, the seventh being the smallest of all. There are generally three terminal hooks; occasionally minute spines may be seen near the articulation of the sixth and seventh joints. The first joint is the stoutest, and in the first pair of these appendages it has something to do with mastication, functioning perhaps as a lower lip. The abdominal combs are slender and elongated, and composed of a transverse triarticulated piece, and of eighteen little laminæ attached to it. The dorso-abdominal shields, seven in number, increase in size from forwards backwards, the anterior one being the narrowest of all. Their surface exhibits minute granules not very conspicuous. There are only five ventral shields, nearly equal in size; the posterior one somewhat different in shape, and not provided with stigmata. The caudal appendage (tail) is as long as the body, and composed of five joints and a poison bag. The two first joints are the smallest, the fifth being the

longest; the poison bag is swollen up and provided with a slightly curved and acute hollow spine. The upper part of each joint is concave or grooved, whilst the inferior part is convex. They are carinated, and rows of conspicuous granules are observed along the carinæ.

The color of the body above is uniform greenish yellow; the thoracic appendages (feet) are yellowish, whilst the palpi and caudal appendage (tail) reflect a reddish shade upon the yellow ground.

The specimen figured was collected in the Valley of the Great Salt Lake of Utah, by Capt. Howard Stansbury.

A much smaller specimen was brought from Eagle Pass, Texas, by Mr. Arthur Schott, of the United States and Mexican boundary.

Plate XVI, fig. 5, represents, size of life, *S.* (*Telegonus*) *boreus* seen from above.

Fig. 6 is a view from beneath, to show the abdominal combs, first abdominal segment, and origin of fourth and third pairs of feet.

Fig. 7 represents the distribution of the ocelli.

2. Scorpio (Atreus) californicus, Girard.

General form of body and appendages slender when compared to the preceding species. The tail is almost twice the length of the body; there is not the same disproportion of length between the first and second joints and the remaining ones. The carinæ and rows of granules are much less conspicuous. The cephalothorax and dorso-abdominal shields exhibit carinæ and rows of granules not only on the palpi, but likewise on the feet. Rows of granules may be seen along the angular projections or carinæ. The chelæ are much slenderer, the hand (carpus) and poison bag much smaller. An exceedingly minute spine may be observed on the poison bag under the sting. The lateral ocelli are situated more anteriorly, more apart from each other, and equal amongst themselves. The abdominal combs are composed of twenty laminæ.

Color light brown; palpi and tail deeper; upper part of abdomen blackish, with a median light vitta.

One specimen was collected in California and presented by Dr. Stone to the Smithsonian Institution.

3. Scorpio (Atreus) sayi, Girard.

Syn.—*Buthus vittatus*, Say, Jour. Acad. Nat. Sc. Philad. II, 1821, 61.

Upon a close examination of several specimens of this species obtained from western Florida, we satisfied ourselves that it belongs to the subgenus *Atreus* instead of *Buthus*, in which it was placed by Thomas Say. It so happens that the specific name of *vittatus* has since been given by Guérin to another South American species of scorpions; and if we propose here to replace Say's specific name, against the received law of priority, we would remark that when full grown, the vittæ entirely disappear, and the color becomes uniform deep reddish brown, the legs and under surface being lighter. In this species the tail is once and a half the length of the body. The palpi are proportionally small, and in the young, exiguous. The chelæ are slender, slightly curved, with an undulation at their base, but without marked denticulations. The upper surface is finely granular. There are from thirty to thirty-two laminæ to the abdominal combs. "Fuscous, with three fulvous vittæ, sides black," applies strictly to the immature state.

Specimens of this species were sent from Pensacola, Florida, to the Smithsonian Institution, by Dr. Jeffrey, U. S. N., and Dr. J. F. Hammond, U. S. A.

A species very closely allied, if not identical with *Scorpio* (*Atreus*) *sayi*, is not uncommon in Texas, where several specimens were collected by Lieut. D. N. Couch, U. S. A.

IV. PSEUDOSCORPIONIDÆ.

Observations upon Galeodes subulata of Thomas Say.

Two species of this genus are described by the same author in Major Long's Expedition;* one under the name of *Galeodes pallipes*, the other under that of *G. subulata*, the only difference between them consisting in the structure of the cheliceræ, which in *G. pallipes* are terminated by arcuated claws, armed within with many robust teeth, whilst in *G. subulata* the upper claw is nearly rectilinear, and the lower one alone possessed with two robust teeth.

Having but one individual of this genus at our command, we are not prepared to decide upon the question of the validity of both species. The specimen before us answers to Say's characters of *G. subulata;* and being perfectly satisfied that it belongs to the latter species, we propose to describe it a little more at length than was done by its discoverer.

*Account of an expedition from Pittsburg to the Rocky Mountains, performed in the years 1819 and '20. Vol. II, 1823, p. 3.

The entire length, from the tip of the cheliceræ to the end of the abdomen, is one inch and a quarter, the abdomen itself forming about one-half of that length. The cephalothorax is composed of three distinct segments; the anterior one much the largest, giving points of attachment to the parts of the mouth, to the palpi, and the two anterior pairs of legs; to the second thoracic segment is attached the third pair of legs, and to the third segment the fourth pair. The anterior segment of cephalothorax, seen from above, is subrhomboidal and smooth. At its anterior margin are situated the two ocelli, separated from each other by a deep groove. The cheliceræ are very stout, and composed of one single joint densely covered with setose hairs, and terminated each by two spines, one above (finger of some authors), rigid, and another below (the thumb), moving vertically against the upper. The latter is compressed, acute, almost rectilinear, and smooth; the inferior one is subconical, curved upwards, acute towards the point, and provided at its base inwardly with two spiny small processes. The palpi are proportionally robust, stouter and longer than the three anterior pairs of legs; somewhat shorter than the fourth pair, but of a stouter appearance, as all the joints, four in number (the maxillæ excepted), preserve the same diameter. They are covered on their whole length with hairs similar to those on the cheliceræ. The maxillæ are subtriangular, provided only with brushes of hairs. The next joint (the joint of the palpi) is very small and triangular; the second is the longest; the third is the next in length; then the fourth, the tip of which exhibits a minute smooth tuberculiform knob. The first pair of legs is the most slender of the thoracic appendages, and about the length of the third pair; the basal joint is quite short; the second is the shortest of all; the third is the longest; the fourth, fifth, and sixth smaller in the order enumerated. The last joint terminates like the palpi, bluntly. This anterior pair of legs is called by some *second pair of palpi*, upon the ground that their structure is most alike. The three remaining pairs of thoracic appendages are seven-jointed, thus composed of one joint more than in the first pair and palpi, and furthermore terminated by two minute curved claws. The first, second, and third joints are short, stoutish, and subequal; the remaining are longer and slenderer, the fourth being the longest, and the other diminishing gradually. They are covered upon their whole length with hairs similar to those which cover the palpi, but perhaps less densely so. The abdomen is subovoid, being a little depressed; it is densely hairy above and below, and composed, as usual, of nine segments or annuli.

Collected on June the 10th.

MYRIAPODS.

BY CHARLES GIRARD.

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1. Scolopendra heros, Girard.

Zoology, Pl. XVIII.

Spec. char.—Twenty-one pairs of grallatory appendages, composed of five segments or articulations, and a conical terminal spine, more or less curved. Back bicarinated; beneath, flat and grooved. Antennæ composed of twenty-five joints; color uniform dark-reddish brown; lighter beneath.

Description.—The general form of the body is depressed, subconcave above, flat beneath. It is composed of twenty-one annuli, segments or rings, each of which bears one pair of locomotory appendages, (feet). The middle region of the back presents a slight double carina and last segment. The intermediate area is rather flattened, whilst each running parallel the whole length of the body, very faint on the first side is gently sloping towards the exterior margin. At the inferior surface, two longitudinal furrows or grooves may be seen extending the whole length of the body, and dividing the abdominal disk into three almost equal parts. The stigmata are transversely elongated, and situated immediately beneath the lateral margin of the dorsal shields of each segment. The insertion of the locomotory appendages takes place immediately above the lateral margin of the abdominal shields of each segment. The locomotory appendages are as numerous as the segments of the body—twenty-one pairs constructed alike; that is to say, composed of five joints and a curved terminal spine. A minute spine may occasionally be seen at the anterior margin of the fourth and fifth joints. The third and fourth joints are longer than the first and second; the fifth is always the smallest: these organs are tapering rapidly towards their extremity. In the caudal pair, the first and second articles or joints are longer than the third and fourth; the first one is, moreover, provided with a spiny process along its inner margin. Its general shape and directing distinguishes it, likewise, from all the other pairs.

The second segment is quite short, the shortest of all, and contrasts strangely with the others, which preserve regular proportions, gradually diminishing from the middle of the length towards both extremities, with but few exceptions. The first segment or ring is one of these, being the shortest after the second; its anterior margin is subcrescentic, the concavity of which receives the cephalic shield or disk (head). Besides the anterior pair of locomotory appendages, it gives a point of attachment to a pair of robust and two-jointed forceps, functioning as a pair of jaws for seizing and holding the prey. The central piece is large and subtriangular, the anterior margin of which is denticulated, (the second lip of some authors). That second or external lip (labrum) is formed by the union of two pieces, which are separate in the young, where they constitute a third joint to the forceps-jaws, the second lip then being also separate, and existing as a limina already denticulated anteriorly. The next joint is short and stout; the second is a conical and tapering spine, curved inwardly and perforated, as it is well known for the passage of a venomous fluid, not otherwise dangerous.

The cephalic disk itself, seen from above, is subcircular in shape, projecting slightly between the antennæ, and showing upon its surface traces of the dorsal carinæ alluded to above. To its inferior surface we find attached two pairs of mandibles and one pair of palpi. In proceeding from outwards inwards, we will find immediately behind the forceps jaws the palpi (little feet, sometimes called), composed of four flattened joints and a minute, curved, and terminal hook. They are united at their base by the means of two additional central pieces. The second joint is the longest, and slightly bent. The exterior pair of mandibles, the one next to the palpi, is composed of four joints, the first being almost as long as the three remaining ones; the fourth is rounded, presenting an inner concave surface with a sharp terminal margin. They are united upon their middle by a lanceolated ligula. The inner pair of mandibles is composed of two pieces; the first irregularly shaped, the second subcircular concave, subcircular and margined anteriorly by small spines, four or five in number, constituting a denticulated margin.

In the anterior margin of the cephalic disk are inserted the antennæ, composed of twenty-five joints gradually diminishing in thickness, and increasing in length towards the extremity, which is filiform. Exteriorly to the antennæ, and close to the margin of the disk, are situated the ocelli, four on each side, as usual in the genus, and disposed as represented in figure 5.

The inferior surface of the last ring differs from the others in having a much smaller shield, and in being provided on each side with a stout, subconical spine, directed backwards.

An immature specimen, one-third of the length of the one figured, has the same number of segments or annuli, the same number of feet, and the same general structure.

One individual of this species was collected, on the 15th of June at Sweet-water creek; others were found in July, between the south fork of Red river and Otter creek.

Plate XVIII, fig. 1, represents *Scolopendra heros* size of life, seen from above.

Fig. 2. The head from below.

Fig. 3. Posterior extremity from below.

Fig. 4. A medial segment to show the attachment of feet.

Fig. 5. Disposition of ocelli on left side.

2. Julus ornatus, Girard.

Spec. char.—Ground-color bluish black; segments narrowly margined posteriorly with reddish; anterior margin of segments rather blue, whilst the middle is rather black, thus giving the appearance of three rings of color. The anterior portion, which is covered by the articulation, is fulvous. Feet deep chestnut-brown. Antennæ rufous at base, blackish at tip. Stigmata not conspicuous; marked by a series of small, obsolete blackish spots.

Remarks.—This species is allied to *Julus marginatus* of Say, but its body is proportionally much stouter. The ocelli are disposed upon a subtriangular space quite different in shape. The antennæ themselves are slenderer in proportions. The labrum (upper lip) is also less emarginated than in *Julus marginatus*, and the marginal punctures much less conspicuous.

One specimen was collected, on the 27th of June.

3. Julus atratus, Girard.

Spec. char.—Body, feet, and antennæ, uniform deep blackish brown; antennæ and feet occasionally reddish, as also the labrum and anterior margin of first segment. Posterior third of each segment of a shining black. Stigmata and lateral striæ beneath quite conspicuous.

REMARKS.—Resembles more *Julus ornatus* than *Julus marginatus* in the general proportions of the body, but in the structure of the antennæ and labrum comes nearer to *Julus marginatus*.

Specimens of this species were collected at Prairie Mer Rouge, Louisiana, by James Fairie, Esq., and sent to the Smithsonian Institution.

APPENDIX G.

BOTANY

DESCRIPTION OF THE PLANTS COLLECTED DURING THE EXPEDITION: BY DR. JOHN TORREY.

APPENDIX G.

BOTANY.

BY JOHN TORREY, M. D.

No. 96, St. Mark's Place, New York,
August, 10, 1853.

Dear Sir: I have examined the collection of plants that you brought from the headwaters of the Red river, towards the Rocky mountains. The flora of this region greatly resembles that of the upper portion of the Canadian. It is remarkable that there occur among your plants several species that were first discovered by Dr. James, in Long's Expedition, and have not been found since until now. Your collection is an interesting addition to the geography of North American plants, and serves to mark more clearly the range of many western species. For particular remarks on the rarer plants, and descriptions of the new species, I refer you to the accompanying list.

At your request I have had some of the rarer plants drawn and engraved, to illustrate your report to Congress.

I am, dear sir,

Yours truly,

JOHN TORREY.

Captain R. B. Marcy.

RANUNCULACEÆ.

CLEMATIS PITCHERI, Torr. and Gr., Fl. 1, p. 10. Witchita Mountains; fl. and fr. July 17.

ANEMONE CAROLINIANA, Walt.; Torr. and Gr., Fl. 1, p. 12. Sources of the Trinity River; May 3.

DELPHINIUM AZUREUM, Michx.; Torr. and Gr., Fl. 1, p. 32. Main Fork of the Red River; fl. May 8—June 16.

PAPAVERACEÆ.

ARGEMONE MEXICANA, Linn.; Torr. and Gr., Fl. 1, p. 61. Common on the upper waters of the Red River; May—June 16.

CRUCIFERÆ.

VESICARIA ANGUSTIFOLIA, Nutt., in Torr. and Gr., Fl. 1, p. 101; Gray, Pl. Lindh. 2, p. 145. Sources of the Trinity River; fl. and fr. May 3.

V. STENOPHYLLA, Gray, Pl. Lindh. 2, p. 149; and Pl. Wright. 1, p. 10, and 2, p. 13. North Fork of the Red River; fr. June 14.

DITHYRÆA WISLIZENI, Engelm., in Wisliz. N. Mex., p. 95; Gray, Pl. Wright. 1, p. 10, and 2, p. 14. Abundant on the headwaters of the Red River; June 23—July 14.

The specimens of this plant collected by Captain Marcy vary considerably in the leaves, which are often nearly entire. The flowers also vary in size; the petals being sometimes nearly one-third of an inch in length. The silicles are larger than in specimens collected in New Mexico by Mr. Wright and Dr. Edwards. They are by no means always deeply emarginate at the base, and sometimes they are slightly notched at the summit.

STREPTANTHUS HYACINTHOIDES, Hook., in Bot. Mag., t. 3516; Torr. and Gr., Fl. 1, p. 78; Gray, Gen. Ill., t. 61. Witchita Mountains to the boundary of the Choctaw Nation; fl. May 31—June 4.

CAPPARIDACEÆ.

POLANISIA GRAVEOLENS, Raf.; Torr. and Gr., Fl. 1, p. 123, and Suppl., p. 669. Witchita Mountains; fl. and fr. July 16. The pods are on a short stipe, and the seeds are more or less rough.

CARYOPHYLLACEÆ.

SILENE ANTIRRHINA, Linn., Torr. and Gr., Fl. 1, p. 191. On the Main Fork of the Red River; fl. May 8.

PARONYCHIA JAMESII, Torr. and Gr., Fl. 1, p. 170; Gray, Pl. Fendl., p. 14. Middle Fork of Red River; fl. May 22.

PORTULACACEÆ.

TALINUM TERETIFOLIUM, Pursh, Fl. 2, p. 365; Gray, Gen. Ill., t. 98. Middle Fork of Red River; fl. May 22, fr. July 5.

MALVACEÆ.

MALVASTRUM COCCINEUM, Gray, Gen. Ill., t. 121; Pl. Fendl., p. 24. *Malva coccinea*, Nutt. *Sida coccinea*, DC.; Torr. and Gr., Fl. 1, p. 235. North Fork of Red River, &c.

CALLIRRHOE INVOLUCRATA, Gray, Pl. Fendl., p. 15, and Gen. Ill., t. 117. *Malva involucrata*, Torr. and Gr., Fl., p. 226. Middle Fork of Red River; fl. May 22.

C DIGITATA, Nutt. in Jour. Acad. Phil. 2, p. 181; Gray, l. c. Fort Belknap.

LINACEÆ.

LINUM BERLANDIERI, Hook. Bot. Mag., t. 3480; Engelm. in Gray, Pl. Wright. 2, p. 25. Cache creek, and Cross-Timbers of the Red River; May.

L. BOOTTII, Plauch., in Lond. Jour. Bot. 7, p. 475; Engelm. l. c. Witchita Mountains; fl. and fr. July 17.

OXALIDACEÆ.

OXALIS VIOLACEA, Linn.; Torr. and Gr., Fl. 1, p. 211. Headwaters of the Trinity River; April 25.

O. STRICTA, Linn.; Torr. and Gr., Fl. l. c. With the preceding.

GERANIACEÆ.

GERANIUM CAROLINIANUM, Linn.; Torr. and Gr., Fl. 1, p. 207. Headwaters of the Trinity, and on Cache Creek; April—May.

ZANTHOXYLACEÆ.

PTELEA TRIFOLIATA, Linn.; Torr. and Gr., Fl. 1, p. 215; *β. mollis.* Torr. and Gr., Fl. 1, Suppl., p. 680. Common on the headwaters of the Red River; fr. June 16.

ANACARDIACEÆ.

RHUS TRILOBATA, Nutt., in Torr. and Gr., Fl. 1, p. 218; Gray Pl. Fendl., p. 28. On the Middle and North Forks of the Red River; in fruit June 1–16.

R. TOXICODENDRON, Linn.; Torr. and Gr., l. c. With the preceding in fruit only.

VITACEÆ.

VITIS RUPERTRIS, Scheele, in Linnæa, 21, p. 591; Gray, Pl. Lindh., 2, p. 165. Witchita Mountains; abundant. The fruit was immature, but had attained nearly its full size in the middle of July. They are said to be ripe in August, when they are about the size of large peas, of a deep purple color, and agreeable to the taste. This species much resembles the summer grape of the Atlantic States.

SAPINDACEÆ.

SAPINDUS MARGINATUS, Willd.; Torr. and Gray, Fl. 1, 255; Gray, Gen. Ill., 2, t. 180. Main Fork of Red River.

This is generally known in Texas and Arkansas by the name of *Wild China.* It is a tree, and attains the height of 20 feet, with a trunk 10 inches in diameter. The wood is of a yellow color.

POLYGALACEÆ.

POLYGALA ALBA, Nutt. Gen. 2, p. 87; Gray, Pl. Wright. 1, p. 38. *P. Beyrichii*, Torr. and Gr., Fl. 1, p. 670. On Suydam Creek, North Fork of Red River; fl. June 6.

P. INCARNATA, Linn.; Torr. and Gr., 1, p. 129. Tributaries of the Washita River; fl. and fr. July 23. This species has not hitherto been found so far west.

KRAMERIACEÆ.

KRAMERIA LANCEOLATA, Torr., in Ann. Lyc. N. York, 2, p. 168; Gray, Gen. Ill., 2, t. 185. Headwaters of the Trinity, and on the Middle Fork of the Red River; fl. May 4–22.

LEGUMINOSÆ.

VICIA MICRANTHA, Nutt., in Torr. and Gr., Fl. 1, p. 271. Cache Creek and Middle Fork of Red River; fl. and fr. May 16–22.

RHYNCHOSIA TOMENTOSA, var. *volubilis*, Torr. and Gr., Fl. 1, p. 285. Tributaries of the Washita River; fl. July 26.

TEPHROSIA VIRGINIANA, Pers.; Torr. and Gr., Fl. 1, p. 295. Witchita Mountains and upper waters of Red River; fl. June 4, fr. July 23.

GLYCYRRHIZA LEPIDOTA, Nutt., Gen. 2, p. 106; Torr. and Gr., Fl. 1, p. 298. Main and North Forks of the Red River; fl. June 6, fr. June 26.

INDIGOFERA LEPTOSEPALA, Nutt., in Torr. and Gr., Fl. 1, p. 298. With the preceding; fl. May 26–June 6.

PSORALEA ESCULENTA, Pursh, Fl. 2, p. 475, t. 22. Mouth of Cache Creek, and Witchita Mountains; May.

P. ARGOPHYLLA, Pursh, Fl. 2, p. 475; Hook. Fl. Bor.—Am. 2, p. 136, t. 53. North and Middle Forks of Red River; fl. May 26–31.

P. FLORIBUNDA, Nutt., in Torr. and Gr., Fl. 1, p. 300. Sources of the Red River; fl. June 2–9.

PETALOSTEMON VIOLACEUM, Michx., Fl. 2, p. 50, t. 37, f. 2; Torr and Gr., Fl. 1, p. 310. With the preceding; June 2–7.

PETALOSTEMON GRACILE, Nutt. in Jour. Acad. Phil. 7, p. 92; Torr and Gr., Fl. 1, p. 309. Cache Creek; May 18.

P. MULTIFLORUM, Nutt., l. c.; Torr. and Gr., l. c. On the Witchit Mountains; fl. and fr. July 15.

PETALOSTEMON VILLOSUM, Nutt., Gen. 2, p. 85; Torr. and Gr., Fl. 1, p. 310. Cache Creek; June 14; flowers not yet expanded.

DALEA AUREA, Nutt., Gen. 2, p. 101; Torr. and Gr., Fl. 1, p. 308; Gray, Pl. Wright. 2, p. 41. Main Fork of Red River; fl. July 5.

D. LANATA, Spreng, Syst. 3, p. 327. *D. lanuginosa*, Nutt., in Torr. and Gr., Fl. 1, p. 307. Big Witchita and on the Main Fork of the Red River; fl. June 27.

D. LAXIFLORA, Pursh, Fl. 2, p. 741; Nutt., Gen. 2, p. 101; Torr. and Gr., Fl. 1, p. 307. *D. pencillata*, Moricand, Pl. Nouv. Amer., t. 45. Common on all the upper waters of the Red River; May–July.

AMORPHA CANESCENS, Nutt., Gen. 2, p. 92; Torr. and Gr., Fl. 1, p. 306. Witchita Mountains; fl. May 30.

ASTRAGALUS NUTTALLIANUS, DC. Prodr. 2, p. 289; Torr. and Gr. 2, p. 234. Upper waters of the Red River; fl. and fr. May 5. The flowers are larger than usual in this species.

A. CARYOCARPUS, Ker. Bot. Reg., t. 176; Torr. and Gr., Fl. 1, p. 331. Headwaters of the Trinity. May 2; in flower only.

OXYTROPIS LAMBERTI, Pursh, Fl. 2, p. 740; Torr. and Gr., Fl. 1, p. 339. With the preceding; fl. in May.

DESMODIUM SESSILIFOLIUM, Torr and Gr. 1, p. 363. Witchita Mountains. The specimens of this plant collected by Captain Marcy are in a state of remarkable *fasciation*. The branches of the panicle are coalesced, (sometimes almost to the summit,) into a broad flat mass, which is covered with sessile flowers and fruit.

CLITORIA MARIANA, Linn.; Torr. and Gr., Fl. 1, p. 290; Torr., Fl. N. York, 1, p. 163, t. 24. On the Washita; fl. July 27.

BAPTISIA AUSTRALIS, R. Br.; Torr. and Gr., Fl. 1, p. 385. Sources of the Red River; fl. and fr. June 6–10.

B. LEUCOPHÆA, Nutt., Gen. 1, p. 282; Torr. and Gr., l. c. Common on the upper tributaries of the Red River; fl. April, fr. May.

HOFFMANSEGGIA JAMESII, Torr. and Gr., Fl. 1, p. 293; Gray, Pl. Lindh. 2, p. 178. With the preceding; fl. and fr. June 14–24.

CASSIA CHAMÆCRISTA, Linn.; Torr. and Gr., Fl. 1, p. 395. Tributaries of the Washita; fl. July 22.

SCHRANKIA UNCINATA, Willd.; Torr. and Gr., Fl. 1, p. 400. Mouth of Medicine River, &c.; fl. April.

ACACIA LUTEA, Leavenw.; Torr. and Gr., Fl. 1, p. 403. On the Witchita Mountains; fl. and fr. July 14. The leaves are remarkably sensitive.

ROSACEÆ.

SANGUISORBA ANNUA, Nutt., in Torr. and Gr., Fl. 1, p. 429. *Poterium annuum*, Hook. Fl. Bor.—Am. 1, p. 198.

ONAGRACEÆ.

ŒNOTHERA RHOMBIPETALA., Nutt., in Torr. and Gr., Fl. 1, p. 493; Kunze, in Linnæa, 20, p. 57. Main Fork of Red River; fl. June 24.

Œ. SINUATA, Linn.; Torr. and Gr., Fl. 1, p. 294. Witchita Mountains and upper tributaries of the Red River; May–June.

Œ. SPECIOSA, Nutt., in Jour. Acad. Phil. 2, p. 119; Torr. and Gr., Fl. l. c. Big Witchita; fl. May 8. Middle Fork of the Red River; fr. June 21.

Œ. LAVANDULÆFOLIA, Torr. and Gr., Fl. 1, p. 501; Hook. Lond. Jour. Bot. 6, p. 223, Gray, Pl. Wright. 1, p. 72. Big Witchita and North Fork of Red River; fl. May 8, fr. June 6. The leaves in all our specimens of this rare species are nearly glabrous, about one inch and a half long, and 2–3 lines wide, with the apex rather acute. The fruit is well described by Hooker, (l. c.)

Œ. SERRULATA, Nutt. Gen. 1, p. 246; Torr. and Gr., Fl. 1, p. 501. Common on the upper tributaries of the Red River; May–June.

GAURA COCCINEA, Nutt. Gen. 1, p. 249; Torr. and Gr., Fl. 1, p. 518. North Fork of Red River; fl. June 6.

G. VILLOSA, Torr. Ann. Lyc. N. York, 2, p. 200; Torr. and Gr., Fl. 1, p. 518; Gray, Pl. Wright, 1, p. 73. Witchita Mountains; fr. July 14. The ripe fruit is not always reflexed. It is (including the stipe) about

7 lines long, ovate, strongly tetraquetrous, abruptly contracted at the base, and 2–4-seeded: the seeds more or less imbricated.

LOASACEÆ.

MENTZELIA NUDA, Torr. and Gr., Fl. 1 p. 535; Gray, Pl. Fendl., p. 47, and Pl. Wright. 1, p. 73; *Bartonia nuda*, Nutt. Gen. 1, p. 297. Witchita Mountains; fl. June 22.

CUCURBITACEÆ.

CUCURBITA PERENNIS, Gray, Pl. Lindh. 2, p. 193; and Wright. Pl. 2, p. 60. *C. fœtidissima*, H. B. and Kunth? *Cucumis perennis*, James, in Long's Exped. 2, p. 20; Torr. and Gr., Fl. 1, p. 543. North fork of the Platte; fl. June 6. Although the cultivated plant seems to be dicœcious not unpleasant to the smell, Mr. Wright says, (*vide* Gray, l. c.) that in a wild state it is "certainly monoccious, and exhales an unpleasant smell when bruised;" so that it does not differ from the description of *C. fœtidissima*, except that the latter is said by Kunth to be an annual, which may be a mistake. The flowers are as large as those of the common pumpkin.

SICYDIUM, sp. nov.? Fruit 1½ inch in diameter, globose, sessile. Seeds ⅛ larger than in *S. Lindheimeri*, and more turgid. On the Main Fork of Red River; fr. July 11.

GROSSULACEÆ.

RIBES AUREUM, Pursh, Fl. 1, p. 164; Torr. and Gr., Fl. 1, p. 552. North Fork of Red River; fr. June 4.

UMBELLIFERÆ.

ERYNGIUM DIFFUSUM, Torr., in Ann. Lyc. N. York, 2, p. 207; Torr. and Gr., Fl. 1, p. 603. Witchita Mountains; fl. June 14. This rare species has not been found before, since it was first discovered by Dr. James, more than thirty years ago. It is rather doubtful whether it is diffuse, except, perhaps, when it is old. The specimens of Captain Marcy are less branched than the original one from which the description in the Flora of North America was drawn.

LEPTOCAULIS ECHINATUS, Nutt., in DC. Prodr. 4, p. 107; Torr. and Gr., Fl. 1, p. 609. Headwaters of the Trinity; April 2.

Polytænia Nuttallii, DC. Umb., p. 53, t. 13, and Prodr. 4, p. 196; Torr. and Gr., Fl. 1, p. 533. Middle Fork of Red River; fl. June 1. Witchita Mountains; fr. July 16.

Eurytænia Texana, Torr. and Gr., Fl. 1, p. 633. Main Fork of Red River; fr. June 11. This plant has hitherto been found only by the late Mr. Drummond, who discovered it in Texas more than twenty years ago. It is an annual, about two feet high; the fine striæ of the stem and branches are roughened upward, with minute points. The umbels are compound and spreading. Flowers minute. Petals white, broadly orbicular, waved on the margin, deeply emarginate, with an inflexed point. Fruit about one-third larger than in Drummond's Texan specimen.

RUBIACEÆ.

Oldenlandia angustifolia, Gray, Pl. Wright. 2, p. 68. *Houstonia angustifolia*, Mich. Fl. 1, p. 85; *Hedyotis stenophylla*, Torr. and Gr., Fl. 2, p. 41. Tributaries of the Main Fork of Red River; fl. May—June.

VALERIANACEÆ.

Fedia radiata, β. leiocarpa, Torr. and Gr., Fl. 2, p. 52. Upper Red River.

COMPOSITÆ.

Liatris squarrosa, Willd.; Torr. and Gr., Fl. 2, p. 68; Sweet Fl. Gard., t. 44. Tributaries of the Washita River; fl. July 22–24.

L. acidota, Engelm. and Gray, Pl. Lindh., p. 10; Gray Pl. Wright. 1, p. 83. *L. mucronata*, Torr. and Gr., Fl. 2, p. 70; not of D. C. On the Washita; July 27.

Solidago odora, Nutt.; Torr. and Gr., Fl. 2, p. 219. Witchita Mountains; July 16.

S. Missouriensis, Nutt. in Jour. Acad. Philad. 7, p. 32, and Trans. Amer. Phil. Soc. (n. ser.) 7, p. 327; Torr. and Gr., Fl. 2, p. 222. With the preceding.

Artemisia filifolia, Torr. in Ann. Lyc. N. York, 2, p. 211; Torr. and Gr., Fl. 2, p. 417. Upper tributaries of the Red River; May. An

abundant shrub, of a grayish white aspect, with numerous branches, and crowded, slender leaves. This is one of the numerous species called *sage* by the hunters. It is found from the plains of the Upper Missouri to the Valley of the Rio Grande, and west to the Colorado.

ACHILLEA MILLEFOLIUM, Linn.; Torr. and Gr., Fl. 2, p. 409. With the preceding. It is the woolly form that almost exclusively occurs west of the Mississippi.

ZINNIA GRANDIFLORA, Nutt. in Trans. Amer. Phil. Soc. (n. ser.) 7, p. 348; Torr. and Gr., Fl. 2, p. 298; Torr. in Emory's Rep., t. 4, Gray, Pl. Fendl., p. 81. Main Fork of Red River; fl. July 2.

RIDDELLIA TAGETINA, Nutt. l. c., p. 371; Torr. and Gr., Fl. 2, p. 362; Torr. in Emory's Rep., t. 5; Gray, Pl. Fendl., p. 93. Main Fork of Red River; June 25—July 8. The pappus is more hyaline and acute than in specimens from other localities in my herbarium. It is also slightly lacerate at the tip, showing something of a transition to *R. arachnoidea*. The leaves, too, are more woolly and broader than in the more common form of the plant.

RUDBECKIA HIRTA, Linn.; Torr. and Gr., Fl. 2, p. 307. Witchita Mountains; fl. June 1. Is *R. bicolor* distinct from this species? Dr. Gray remarks, (Plant. Lindh. 2, p. 227,) that in cultivation, the purple brown of the rays is commonly obsolete or wanting in all the later heads.

ECHINACEA ANGUSTIFOLIA, DC. Prodr. 5, p. 554; Torr. and Gr., Fl. 2, p. 306. Witchita Mountains; June 1.

LEPACHYS COLUMNARIS, Torr. and Gr., Fl. 2, p. 315. *Rudbeckia columnaris*, Pursh, Fl. 2, p. 575. Common on all the tributaries of the Red River; June.

HELIANTHUS PETIOLARIS, Nutt. in Jour. Acad. Philad. 2, p. 115; Sweet Brit. Fl. Gard. (n. ser.) t. 75. With the preceding.

GAILLARDIA PULCHELLA, Foug.; DC. Prodr. 5, p. 652; Torr. and Gr., Fl. 2, p. 366. Common on the upper tributaries of the Red River; May—June.

PALAFOXIA CALLOSA, Torr. and Gr., Fl. 2, p. 369. *Stevia callosa*, Nutt. in Jour. Acad. Philad. 2, p. 121; Bart. Fl. Amer. Sept., t. 46. *β. foliis latioribus.* Tributaries of the Washita; June.

HYMENOPAPPUS CORYMBOSUS, Torr. and Gr., Fl. 2, p. 372. *H. Engelmannianus*, Kunth.

ACTINELLA LINEARIFOLIA, Torr. and Gr., Fl. 2, p. 383. *Hymenoxys linearifolia*, Hook. Witchita Mountains; May 30.

MARSHALLIA CAESPITOSA, Nutt. in DC. Prodr. 5, p. 680; Hook. Bot. Mag. t. 3,704; Torr. and Gr., Fl. 2, p. 391. Headwaters of the Trinity River; May.

APHANOSTEPHUS RAMOSISSIMUS, DC. Prodr. 5, p. 310; Gray, Pl. Wright. 1, p. 93. *A. Riddellii*, Torr. and Gr., Fl. 2, p. 189. *Egletes ramosissima*, Gray, Pl. Fendl., p. 71. Little Witchita and upper tributaries of Red River; May—June. The tube of the disk flowers is indurated in all the specimens.

ENGELMANNIA PINNATIFIDA, Torr. and Gr., in Nutt. Trans. Am. Phil. Soc. (n. ser.) 7, p. 343; and Fl. 2, p. 283. Witchita Mountains; May 30.

MELAMPODIUM CINEREUM, DC. Prodr. 5, p. 518; Gray, Pl. Fendl., p. 78; *M. ramosissimum*, DC. l. c., Torr. and Gr., Fl. 2, p. 271. *M. lencanthum*, Torr. and Gr. l. c. Cache Creek; June 21. A variable species.

CHRYSOPSIS CANESCENS, Torr. and Gr., Fl. 2, p. 256; Gray, Pl. Fendl., p. 77. Main Fork of Red River; July 8.

C. HISPIDA, Hook. Fl. Bor.—Am. 2, p. 22, (under *Diplopappus;*) DC. Prodr. 7, p. 279; Torr. and Gr. l. c.

CENTAUREA AMERICANA, Nutt. in Jour. Acad. Phil. 2, p. 117; Bart. Fl. Amer.—Sept., t. 50; Torr. and Gray, Fl. 2, p. 453. Tributaries of the upper Red River; June—July.

CIRSIUM UNDULATUM, Spreng.; Torr. and Gr., Fl. 2, p. 456. With the preceding.

PYRRHOPAPPUS CAROLINIANUS, DC. Prodr. 7, p. 144; Nutt. in Trans. Amer. Phil Soc. (n. ser.) 7, p. 430. Headwaters of the Trinity and on Cache Creek; May.

LYGODESMIA JUNCEA, Don.; Hook. Fl. Bor.—Am. 2, p. 295, t. 103; Torr. and Gr., Fl. 2, p. 484. Upper tributaries of the Red River; June.

The lower branches are covered at the base with tubers or galls, about the size of cherry-stones, produced by the stings of insects.

L. APHYLLA, DC. Prodr. 7, p. 198; Torr. and Gr., Fl. 2, p. 485. β. *Texana*, Torr. and Gr. l. c. North Fork of Red River; June 16. The numerous radical leaves are 3–4 inches long, runcinately pinnatifid. Achenia angular, distinctly tapering upward.

ASCLEPIADACEÆ.

ASCLEPIAS TUBEROSA, Linn.; Michx. Fl. 1, p. 117; Sweet Brit. Fl. Gard. (ser. 2,) t. 24; Decaisne, in DC. Prodr. 8, p. 567. Torr. Fl. N. York, 2, p. 123. Upper tributaries of Red River; May—June. The leaves vary from ovate and amplexicaul to narrowly linear.

A. SPECIOSA, Torr., in Ann. Lyc. 2, p. 218, and in Fremont's First Rep., p. 95. *A. Douglasii*, Hook. Fl. Bor.-Am. 2, p. 53, t. 142; Decaisne, l. c. Witchita Mountains to the upper tributaries of the Red River; fl. June—July; flowers larger than in any other North American species of Asclepias.

ACERATES PANICULATA, Decaisne, l. c., p. 521; Asclepias viridis, Walt., Fl. Carol. p. 107? *Anantherix paniculatus*, Nutt., in Trans. Amer. Phil. Soc., (n. ser.,) 5, p. 202. Cache Creek and Middle Fork of Red River; fl. May 16, fr. June.

A. DECUMBENS, Decaisne, l. c. *Anantherix decumbens*, Nutt. l. c. Cache Creek; fl. May 17. The follicles oblong, not muricate.

A. ANGUSTIFOLIA, Decaisne, l. c. *Polyotus angustifolius*, Nutt. l. c. Branch of Cache Creek; fl. May 17.

A. VIRIDIFLORA, Ell. sk. 1, p. 317; Torr. Fl. N. York, 2, p. 124; Decaisne, l. c. *Asclepias viridiflora*, Pursh, Fl. 1, p. 181; Hook. Fl. Bor.-Am. 2, p. 53, t. 143. North Fork of Red River; fl. June 4. The specimens collected by Captain Marcy belong to the broad-leaved forms of the plant.

ENSLENIA ALBIDA, Nutt. Gen. 1, p. 164, and in Trans. Amer. Phil. Soc., (n. ser.) 5, p. 203; Decaisne, in DC. Prodr. 8, p. 518. Main Fork of Red River; not in flower.

APOCYNACEÆ.

Apocynum cannabinum, Linn.; Hook. Fl. Bor.—Amer. 2, p. 51, t. 139; Decaisne, in DC. Prodr. 8, p. 439; Torr. Fl. New York, 2, p. —. Common on the upper tributaries of Red River; May—June.

Amsonia salicifolia, Pursh, Fl. 1, p. 184; Decaisne, in DC. Prodr. 8, p. 385. Witchita Mountains; fr. July 16. This is perhaps only a variety of *A. angustifolia*, Michx., and both may not be specifically distinct from *A. tabernæmontana*.

GENTIANACEÆ.

Sabbatia campestris, Nutt., in Trans. Amer. Phil. Soc., (n. ser.,) 5, p. 167; Griseb., in DC. Prodr. 9, p. 50; Engelm. and Gr., Pl. Lindh. 1, p. 15. On the Washita; fl. and fr. July 27.

Erythræa Beyrichii, Torr. and Gr., Fl. 2, ined. *E. trichantha* β. *angustifolia*, Griseb. l. c. With the preceding; fl. and fr. July 26.

Eustoma Russelianum, Don.; Griseb. in DC. Prodr. 8, p. 51. *Lisianthus glaucifolius*, Nutt. l. c. *L. Russelianus*, Hook. Bot. Mag., t. 3626. Washita River to the upper tributaries of the Red River; July.

CONVOLVULACEÆ.

Evolvulus pilosus, Nutt. Gen. 1, p. 174, (as a synonym); Trans. Amer. Phil. Soc., (n. ser.,) 5, p. 195. *E. argenteus*, Pursh, Fl. 1, p. 187; Choisy, in DC. Prodr. 9, p. 443; not of R. Br. Middle Fork of Red River; fl. May 22. Choisy doubtingly refers Brown's plant to *E. hirsutus*, Lam., and therefore has adopted Pursh's name.

Convolvulus lobatus, Engelm., and Gray, Pl. Lindh. 1, p. 44 (in a note.) *C. hastatus*, Nutt., in Trans. Amer. Phil. Soc., (n. ser.,) 5, p. 194; not of Thunb. *C. Nuttallii*, Torr. in Emory's Rep., p. 149. Middle Fork of Red River; May 22—June 6. This species has much the appearance of *C. althæoides*, Boss.

C. (Ipomœa) leptophyllus, Torr., in Frem. First Report, p. 94, and in Emory's Report, p. 148, t. 11. With the preceding.

C. (Ipomœa) shumardianus, (sp. nov.;) caule gracili subpubescente; foliis ovato-lanceolatis sursum angustatis basi acutis; pedunculis petiolas

longioribus 2-4-floris; sepalis ovatis obtusis. Witchita Mountains; fl. July 17; flowers as large as in *C. panduratus*, which the plant much resembles, but differs in the form of the leaves, and in the broader and more obtuse sepals. Named in honor of Dr. G. C. Shumard, the botanical collector of the expedition.

SOLANACEÆ.

SOLANUM FLAVIDUM, Torr. Ann. Lyc. New York, 2, p. 227; Dunal in DC. Prodr. 13, p. 375. Cache Creek; May. This species is not suffrutescent, as is stated in the original description, but probably annual. Mr. Wright found it on the Rio Grande. The prickles are sometimes almost wanting.

S. CAROLINENSE, Linn.; Torr., Fl. N. York 2, p. 105; Dunal, l. c., p. 305. Witchita Mountains and upper tributaries of the Red River; May–June.

PHYSALIS PUMILA, Nutt., in Trans. Amer. Phil. Soc., (n. ser.,) 5, p. 193. With the preceding; May–June. This species has been overlooked by Dunal in DC. Prodr.

SCROPHULARIACEÆ.

CASTILLEJA PURPUREA, G. Don.; Benth., in DC. Prodr. 10, p. 531. *Euchroma purpurea*, Nutt., l. c., p. 180. Sources of the Trinity River; May.

PENTSTEMON GRANDIFLORUS, Nutt., in Fras. Cat. 1813, and Gen. 2, p. 53; Benth., l. c., p. 322. *P. Bradburii*, Pursh, Fl. 2, p. 738. North Fork of Red River; fl. June 3. The pedicels vary from three lines to nearly an inch in length.

P. AMBIGUUS, Torr., in Ann. Lyc. N. York, 2, p. 228; Benth., l. c., p. 321. Witchita Mountains; June. This rare and well characterized species has lately been found by Mr. Wright on the Upper Rio Grande.

P. COBÆA, Nutt., l. c.; Hook. Bot. Mag., t. 3465; Benth., l. c., p. 326. Upper tributaries of the Red River; May–June.

P. PUBESCENS, Soland.; Torr., Fl. N. York, 2, p. 35; Benth., l. c. Headwaters of the Trinity. Smoothish, with narrower and more entire leaves than usual.

GERARDIA GRANDIFLORA, Benth., Comp. Bot. Mag., 1, p. 206. *Dasystoma Drummondi*, Benth., in DC. Prodr. 10, p. 521. On the Washita; fl. July 27.

LABIATÆ.

MONARDA ARISTATA, Nutt., in Trans. Amer. Phil. Soc., (n. ser.,) 5, p. 186; Benth., in DC. Prodr. 12, p. 363. Main Fork of Red River; May 24–25. Nuttall says that this species is sometimes perennial; but all our specimens seem to be annual. A variety was found on Cache Creek, in which the teeth of the calyx are aristate from a broad base, and strongly hispid-ciliate. The corolla is not spotted, as in the ordinary form.

M. PUNCTATA, Linn.; Benth., l. c.; Torr., Fl. N. York, 2, p. 59. *M. lutea*, Michx., Fl. 1, p. 16. North and Middle Forks of Red River; May–June. A dwarfish and annual form, in which the corolla is scarcely spotted, was found in the same region.

TEUCRIUM CUBENSE, Linn.; Benth., in DC. Prodr. 12, p. 578. *T. laciniatum*, Torr., in Ann. Lyc. New York, 2, p. 231. Cache Creek and Middle Fork of Red River; May. This species was incorrectly described by me as "fruticulose" in the work quoted.

SCUTELLARIA RESINOSA, Torr., in Ann. Lyc. N. York, 2, p. 232; Benth., in DC. Prodr. 12, p. 427. Cache Creek and Sweetwater Creek; May 18–June 9.

S. PARVULA, Michx., Fl. 1, p. 12; Benth., l. c.; Torr., Fl. N. York, 2, p. 71. *S. ambigua*, Nutt., Gen. 2, p. 37.

VERBENACEÆ.

LIPPIA CUNEIFOLIA, Torr., in Ann. Lyc. N. York, 2, p. 234, (under *Zapania*.) Witchita Mountains, and on the Washita; June 1–27. Schauer has overlooked this species, in his revision of *Verbenaceæ* for DC. Prodr.

VERBENA BIPINNATIFIDA, Engelm. and Gray, Pl. Lindh. 1, p. 49; Schauer, in DC. Prodr. 11, p. 553. *Glandularia bipinnatifida*, Nutt., in Jour. Acad. Phil. 2, p. 123, and in Amer. Phil. Trans. (n. ser.) 5, p. 184. Sources of the Trinity and upper tributaries of Red River; May–June.

BORAGINACEÆ.

EUPLOCA CONVOLVULACEA, Nutt., in Amer. Phil. Trans., (n. ser.) 5, p. 190; DC. Prodr. 9, p. 559. Middle Fork of Red River; fl. June 23. I am now convinced that my *E. grandiflora* (Emory's Report, p. 147) is an unusually large-flowered state of the present species. The plant is abundant on the Upper Rio Grande.

ERITRICHIUM JAMESII. *Myosotis suffruticosa*, Torr., in Ann. Lyc. N. York, 2, p. 225; DC. Prodr. 10, p. 114. North Fork of Red River; fl. and fr. June 14. This plant had not been found, till Captain Marcy collected it, since it was discovered by Dr. James, in Long's Expedition. It is a genuine *Eritrichium*, but can hardly be referred to any one of De Candolle's sections of that genus. My description (l. c.) was drawn from old and imperfect specimens, the stems of which were indurated at the base so as to appear suffrutescent. As more complete specimens show the plant to be herbaceous, the former specific name is not appropriate. The allied Fendlerian species No. 636 (*E. multicaule* Torr. Mss.) is very hispid and canescent, with spreading hairs, and throws up several stems from a thick root or caudex. Leaves linear-spatulate and obtuse. Flowers on conspicuous pedicels. Fructiferous calyx broadly ovate, nearly erect; the segments ovate-lanceolate and closed over the fruit. Nutlets truncate at the summit, very smooth and shining.

POLEMONIACEÆ.

PHLOX PILOSA, Linn.; Benth., in DC. Prodr. 9, p. 305. Sources of the Trinity; May.

PRIMULACEÆ.

DODECATHEON MEADIA, Linn.; Pursh, Fl. 1, p. 136; DC. Prodr. 8, p. 56. Sources of the Trinity; fl. May.

SANTALACEÆ.

COMANDRA UMBELLATA, Nutt. Gen. 1, p. 157; Hook. Fl. Bor.-Am. 2, p. 139, t. 79, f. A; Torr. Fl. N. York, 2, p. 160. *Thesium umbellatum*, Linn. Tributaries of the Red River; May. There are few plants that have a wider range in latitude and longitude than this.

EUPHORBIACEÆ.

EUPHORBIA COROLLATA, Linn.; Pursh, Fl. 2, p. 607; Torr. Fl. N. York, 2, p. 175, t. 99. On the Washita; July.

E. MARGINATA, Pursh, Fl. 2, p. 607; Torr. in Ann. Lyc. N. York, 2, p. 224. Main Fork of Red River; July 8. Upper part of the stem hairy.

E. HELIOSCOPIA, Linn.; Torr. Fl. N. York, 2, p. 174, (excl. syn. Pursh;) Gray, Bot. N. States, p. 405. Headwaters of the Trinity; fl. May.

STILLINGIA LANCEOLATA, Nutt. in Trans. Amer. Phil. Soc, (n. ser.) 5, p. 176. *S. sylvatica β. salicifolia*, Torr. in Ann. Lyc. N. York, 2, p. 245. Middle Fork of Red River; fl. June 4.

HENDECANDRA TEXENSIS, Klotsch in Erich. Arch. (1841) 1, p. 252; Engel. and Gray, Pl. Lindh. 1, p. 53. *Croton muricatum*, Nutt. in Trans. Amer. Phil. Soc. (n. ser.) 5, p. 153. *H. multiflora*, Torr. in Frem. First Rep., p. 96. Middle Fork of Red River; fl. and fr. June 22.

GYNAMBLOSIS MONANTHOGYNA. *Engelmannia Nuttalliana*, Klotsch, l. c. *Croton monanthogynum*, Michx. Fl. 2, p. 215. *C. ellipticum*, Nutt. Gen. 2, p. 225, (excl. syn.;) Torr. in Ann. Lyc. N. York, 2, p. 245. Main Fork of Red River; June 24. The *Engelmannia* of Klotsch, which is based on *Croton ellipticum* of Nuttall, must give place to the earlier genus of the same name of Torr. and Gray. I propose for it a manuscript name given to the plant many years ago, when revising the *Euphorbiaceæ* of the United States. Klotsch is wrong in referring *Croton monanthogynum* to *Hendecandra maritima*. In the young specimens of Captain Marcy all the staminate flowers are 8–10 androus: and the later flowers are not unfrequently hexandrous. The petals and sepals vary from three to five.

TRAGIA RAMOSA, Torr. in Ann. Lyc. N. York, 2, p. 245. *T. angustifolia*, Nutt., in Trans. Amer. Phil. Soc. (n. ser.) 5, p. 172. *T. brevispica*, Engel. and Gray, Pl. Lindh. 1, p. 54. North Fork of the Red River; June.

CNIDOSCOLUS STIMULOSUS, Engel. and Gray, Pl. Lindh. 1, p. 26. *Jatropha stimulosa*, Michx. Fl. 2, p. 216; Ell. Sk. 2, p. 649. Cache Creek; May 17.

PLANTAGENACEÆ.

PLANTAGO VIRGINICA, Linn.; Torr. Fl. New York, 2, p. 16. Headwaters of the Trinity; fl. May.

P. GNAPHALOIDES, Nutt. Gen. 1, p. 100; Hook. Fl. Bor.—Am. 2, p. 124; Decaisne in DC. Prodr. 13, (Sect. 1,) p. 713. Mouth of the Big Medicine River.

POLYGONACEÆ.

ERIOGONUM LONGIFOLIUM, Nutt. in Trans. Amer. Phil. Soc. (n. ser.) 5, p. 164; Benth. Eriog. in Linn. Trans. 17, p. 406. Witchita Mountains; June.

CHENOPODIACEÆ.

CHENOPODIUM SUBSPICATUM, Nutt. Gen. 1, p. 199? Middle Fork of Red River. The specimens are without either flowers or fruit. Annual, diffuse, and much branched; clothed with whitish furfuraceous scales. Leaves conspicuously petiolate, broadly rhombic-ovate, with one or two coarse teeth on each side.

OBIONE CANESCENS, Moq. Chenop., p. 74; and in DC. Prodr. 13, (pars 2,) p. 113; Torr., in Stansbury's Report, p. 395. *O. occidentalis*, Moq. l. c. *Calligonium canescens*, Pursh, Fl. 2, p. 370. *Atriplex canescens*, Nutt. Gen. 1, p. 197. Common on the upper tributary of the Red River.

NYCTAGINACEÆ.

OXYBAPHUS ANGUSTIFOLIUS, Torr., in Ann. Lyc. N. York, 2, p. 237; Choisy, in DC. Prodr. 13, (pars 2,) p. 433. *Calymenia angustifolia*, Nutt., in Fras. Cat. 1813, and Gen. 1, p. 26. Upper tributaries of Red River; June.

O. NYCTAGINEUS, Torr. l. c.; Choisy, l. c. *Allionia nyctaginea*, Michx., Fl. 1, p. 100. *Calymenia corymbosa*, Nutt., in Trans. Amer. Phil. Soc., (n. ser.) 5, p. 178; not *Mirabilis corymbosa*, Cav., in which the involucrum is one-flowered. With the preceding; May 28.

O. HIRSUTUS, Sweet; Hook. Fl. Bor.-Amer. 2, p. 124; Choisy, l. c. *Allionia hirsuta*, Pursh, Fl. 2, p. 728. With the preceding. ♃. Stem erect, 2–3 feet high, sparingly branched; viscously pubescent; leaves 2–3 inches long and 1–1½ inch wide, on very short petioles, nearly entire. Flowers in a long, loose terminal and naked panicle; involucre 3-flowered, rotate-companulate. Fruit fusiform, oblong, 5-angled. As in most of the *Nyctaginaceæ*, this plant abounds in cells filled with raphides. These are so abundant in the liber of the root, that they forma layer of a silvery white color.

ABRONIA MELLIFERA, Dougl., in Hook. Bot. Mag., t. 2879; Choisy, l. c. Cache Creek; fl. and fr. May 18. The specimens in the collection agree exactly with Douglas's plant collected in California, and named by Sir William Hooker.

CUPULIFERÆ.

QUERCUS UNDULATA, Torr., in Ann. Lyc., 2, p. 248, t. 4. Abundant on the upper tributaries of the Red River. Stems 1–2 feet long, from a thick woody base, sparingly branched above. Leaves oblong, two inches or more in length, undulate, and furnished with 1–3 rather obtuse and scarcely mucronate teeth on each side, densely and softly pubescent underneath, nearly smooth above, thick and somewhat coriaceous.

CONIFERÆ.

JUNIPERUS VIRGINIANA, Linn.; Michx f. Sylv. 2, p. 353, t. 155; Torr., Fl. N. York, 2, p. 235. *J. sabina*, Hook., Fl. Bor.-Am. 2, p. 166. Middle Fork of Red River.

HYPOXIDACEÆ.

HYPOXIS ERECTA, Linn.; Bart., Fl. N. Amer, 1, t. 35, f. 1; Torr., Fl. N. York, 2, p. 289. Headwaters of the Trinity River; May.

COMMELYNACEÆ.

COMMELYNA ANGUSTIFOLIA, Linn.; Kunth, Enum. 4, p. 53; Torr., Fl. N. York, 2, p. 332. North Fork of Red River; May–June.

TRADESCANTIA VIRGINICA, Linn.; Bot. Mag., t. 105; Bart. l. c., t. 41; Kunth, Enum. 4, p. 81; Torr., Fl. N. York, 2, p. 333. Abundant on

the upper tributaries of Red River; May–June; extremely variable in pubescence, and in the breadth of the leaves.

IRIDACEÆ.

SISYRINCHIUM BERMUDIANA, Linn.; Torr., Fl. N. York, 2, p. 290. Headwaters of the Trinity; May.

NEMASTYLIS ACUTA; with the preceding.

LILIACEÆ.

SCILLA ESCULENTA, Ker. Bot. Mag., t. 1574. *Phalangium esculentum*, Nutt., in Fras. Cat. 1813, Gen. 1, p. 219. *P. Quamash*, Pursh, Fl. 1, p. 226. Headwaters of the Trinity; May.

ALLIUM CANADENSE, Kalm; Pursh, Fl. 1, p. 223; Kunth, Enum. 4, p. 450; Torr., Fl. N. York, 2, p. 308. On Cache Creek; fl. May 14.

A. OCHROLEUCUM, Nutt. Trans. Amer. Phil. Soc. (n. ser.) 5, p. 156; not of Waldst. and Kit. Headwaters of the Trinity; May.

A. RETICULATUM, Fras.? Kunth, Enum. 4, p. 435. *A. angulosum*, β. *lenchorhizum*, Nutt. l. c.? Common on the tributaries of Red River. Bulb usually covered with dark reticulated coats, but sometimes naked.

MELANTHACEÆ.

AMIANTHIUM NUTTALII, Gray, in Ann. Lyc. N. York, 4, p. 123. *Helonias angustifolia*, Nutt., in Trans. Amer. Phil. Soc., (n. ser.) 5, p. 154. *Amiantanthus*, Kunth, Enum. 4, p. 181. Headwaters of the Trinity; May.

CYPERACEÆ.

CYPERUS SCHWEINITZII, Torr. Cyp., p. 276; Fl. N. York, 2, p. 343. *C. alterniflorus*, Schwein., in Long's 2d Exped., 2, p. 381, (not of R. Br.) Middle and North Forks of Red River; May–June.

C. STRIGOSUS, Linn.; Torr. Cyp., p. 261; Fl. N. York, 2, p. 340, t. 136. Witchita Mountains; July.

CYPERUS ACUMINATUS, Torr. and Hook., in Torr. Cyp. Suppl. Witchita Mountains; July 15.

FIMBRISTYLIS SPADICEA, Vahl, Enum. 2, p. 294; Torr. Cyp., p. 346; Kunth, Enum. 2, p. 237; Torr. Fl. N. York, 2, p. 360. Headwaters of the Trinity; May.

CAREX MUHLENBERGII, Schk. Car. 2, p. 12, f. 178; Schwein. and Torr. Car., p. 304; Torr. Fl. N. York, 2, p. 374. Headwaters of the Trinity, and on Cache Creek; May–June.

C. FESTUCACEA, Schk. Car. f. 173; Carey, in Gray's Bot. N. States, p. 545. *C. straminea*, var. *festucacea*, Torr. l. c. With the preceding.

GRAMINEÆ.

PHALARIS ANGUSTA, Nees; Trin. Ic. Gram. t. 78; Kunth, Gram. 2, p. 32. *P. occidentalis*, Nutt., in Trans. Amer. Phil. Soc., (n, ser.) 5, p. 144. On Cache Creek; May 16. This plant is certainly *P. angusta* of Trinius, of which I have specimens named by that distinguished botanist. It appears, however, scarcely to differ from *P. microstaclya*, DC.

PASPALUM LÆVE, Michx. Fl. 1, p. 44; Trin. Panic. Gen., p. 160; Torr., Fl. N. York, 2, p. 421. Main Fork of Red River; June.

PANICUM PAUCIFLORUM, Ell. Sk. 1, p. 120; Gray, Bot. N. States, p. 613. Headwaters of the Trinity; May.

P. RETICULATUM, (n. sp.;) culmo geniculato erecto subsimplici; foliis vaginisque laxe pilosis; panicula oblonga contracta, ramulis racemosis paucifloris; spiculis obovatis acutiusculis glabris breviter pedicellatis muticis; glumis valde inæqualibus; flore neutro bivalvi; palea inferiore (ut in gluma superiora) 7-costulata reticulata, flore hermaphrodito transverse ruguloso. On the Main Fork of Red River; July. Nos. 2090 and 2091, Wright's Coll. N. Mex. 1851–52, are glabrous and more robust forms of this species.

P. OBTUSUM, (H. B. K.?) spicis 5-7 racemosim dispositis erectis; spiculis geminis subimbricatis unilateralibus muticis obovatis obtusis glabris; glumis æqualibus multinervosis; flore inferiore triandro bipaleaceo; flore hermaphrodito subtilissime longitudinaliter striato subnitido.—H. B. and Kunth, Nov. Gen. 1, p. 98? Tributaries of the Washita. Plant glabrous and glaucous, about 18 inches long. Rachis narrowly linear, very flexuous; nerves of the glumes green. Near *P. obtusum*,

H. B. K., but differs in the nearly equal glumes, &c. No. 2092 Wright's Coll. N. Mex. 1851–52, is exactly our plant.

ARISTIDA FASCICULATA, Torr., in Ann. Lyc. N. York, 2, p. 154; Kunth, Enum. 2, p. 196. *A. purpurea*, Nutt. in Trans. Amer. Phil. Soc., (n. ser.) 5, p. 145. Middle Fork of Red River; May—June.

AGROSTIS (SPOROBOLUS) AIROIDES, Torr., in Ann. Lyc. N. York, 2, p. 151. With the preceding. The axils of the panicle are nearly glabrous in Captain Marcy's specimens.

CALAMAGROSTIS GIGANTEA, Nutt. l. c., p. 143. Middle Fork of Red River; June 23.

CHLORIS VERTICILLATA, Nutt. l. c. With the preceding; June 25. An elegant grass, near *C. alba*, Presl. and Torr. in Emory's Rep., p. 153.

BOUTELOUA RACEMOSA, Lag. Var. Cienc. (1805) p. 141; Torr. in Emory's Rep., p. 154; not of Torr. Fl. N. York. *Dinebra curtipendula*, DC.? Kunth, Syn. Pl. Eq. 1, p. 281; excl. syn. Michx. *Eutriana curtipendula*, Trin. Fund. p. 161 (in part); Kunth, Enum. 1, p. 280, and Suppl. p. 233; excl. syn. Michx. and Willd. Main Fork of Red River; July. The detailed description of this species by Kunth, l. c., (drawn from a Mexican specimen collected by Humboldt) shows that the *Chloris curtipendula* of Michaux (*Bouteloua curtipendula*, Torr.) is a distinct species, as indicated in Emory's Report, l. c.

CHONDROSIUM OLIGOSTACHYUM. *Atheropogon oligostachyum*, Nutt. Gen. 1, p. 78; Torr. in Sill. Jour. 4, p. 58. *Eutriana? oligostachya*, Kunth, Gram. 1, p. 96, ex. Enum. 2, p. 282. Main Fork of Red River; July 2.

C. PAPILLOSUM. *Atheropogon papillosum*, Engelm. in Sill. Jour. 46, p. 104. With the preceding, of which it is perhaps only a variety. The species of *Chondrosium* and *Bouteloua* are known by the name of *Grama Grasses* in New Mexico and Texas.

PLEURAPHIS JAMESII, Torr. in Ann. Lyc. N. York, 1, p. 148, t. 10; Kunth, Enum. 1, p. 285. Main Fork of Red River; July. Kunth (l. c.) asks whether this is not *Hymenothecium quinquesetum* of Lagasca; but the brief description of that author (in Gen. et Sp. Pl. Nov. 1816) does not agree with our plant.

SESLERIA DACTYLOIDES, Nutt. Gen. 1, p. 65; Kunth, Enum. 1, p. 323; Torr. in Emory's Report, p. 323, t. 10. Upper tributaries of the Red River; July. This is the well known Buffalo-grass of the western prairies. It is remarkable that neither the grain nor the fertile flowers of this grass are known.

POA (ERAGROSTIS) OXYLEPIS. *P. interrupta*, Nutt. in Trans. Amer. Phil. Soc., (n. ser.) 5, p. 146; not of Lam. Witchita Mountains; July. A very neat grass. The specimens of Captain Marcy are only about 18 inches high.

P. ERAGROSTIS, Linn.; Kunth, Enum. 1, p. 333; Torr., Fl. N. York, 2, p. 458. North Fork of Red River; July.

P. ARACHNIFERA: panicula oblonga contracta, ramulis semiverticillatis; spicis subquinquefloris, lato-ovatis, floribus laxis basi et racheos longe lanoso-arachnoideis; glumis inequalibus anguste-lanceolatis, in carina scabris; palea inferiore lineari-lanceolata acutissima obscure 3-5-nervata, carina inferne ciliata.

β? spiculis 9-10 floris, rachi sparsa lanosa. Headwaters of the Trinity; May.

MELICA GLABRA, Michx. Fl. 1, p. 62. Witchita Mountains; May 30.

KOELERIA CRISTATA, Pers. Syn. 1, p. 97; Kunth, Enum. 1, p. 381. *K. nitida*, Nutt. Gen. 1, p. 74. *K. tuberosa*, Nutt. in Amer. Phil. Trans. (n. ser.) 5, p. 148. Headwaters of the Trinity.

FESTUCA NUTANS, Willd. Enum. 1, p. 116; Kunth, Enum. 1, p. 407; Torr. Fl. N. York, 2, p. 471, t. 158. Witchita Mountains; June.

F. TENELLA, Willd. l c.; Kunth, Enum. 1, p. 397; Torr., Fl. N. York, 2, p. 470, t. 154. Headwaters of the Trinity: taller than the plant of the Atlantic States.

UNIOLA LATIFOLIA, Michx., Fl. 1, p. 71; Ell. Sk. 1, p. 167; Kunth, Enum. 1, p. 425. Witchita Mountains; July. A tall, showy grass, with very large much compressed spikelets.

U. STRICTA, Torr., in Ann. Lyc. N. York, 1, p. 155. *U. multiflora*, Nutt., in Trans. Amer. Phil. Soc. (n. ser.) 5, p. 148. Washita River to the upper tributaries of the Red River; June–July. No. 2033 Wright's Coll. N. Mex. 1851–52 is the same.

TRITICUM REPENS, Linn.; Kunth, Enum. 1, p. 440; Torr., Fl. N. York, 2, p. 474. Common on the tributaries of Red River; May–June. All the specimens are awnless.

ELYMUS CANADENSIS, Linn.; Kunth, Enum. 1, p. 451; Torr., Fl. N. York, 2, p. 476. *E. glaucifolius*, Willd. Cache Creek, &c.; June.

HORDEUM JUBATUM, Linn.; Torr., Fl. Mid. and N. States, 1, p. 158; Kunth, Enum. 1, p. 457. Tributaries of Red River.

H. PUSILLUM, Nutt. Gen. 1, p. 87, and Trans. Amer. Phil. Soc. (n. ser.) 5, p. 151; Kunth, Enum. 1, p. 457.

TRIPSACUM DACTYLOIDES, Linn; Michx. Fl. 1, p. 61; Nutt. l. c.; Kunth, Enum 1, p. 469. North Fork of Red River; June.

ANDROPOGON JAMESII. *A. glaucum*, Torr., in Ann. Lyc. N. York, 1, p. 153; not of Muhl. With the preceding.

EQUISETACEÆ.

EQUISETUM HYEMALE, Linn.; Pursh, Fl. 2, p. 652; Torr., Fl. New York, 2, p. 482. Main Fork of Red River.

EXPLANATION OF PLATES.

Plate I. Anemone Caroliniana.

Fig. 1, a stamen, magnified; fig. 2, a head of pistils; fig. 3, a head of ripe achenia, both magnified; fig. 4, a single achenium, more enlarged.

Plate II. Dithyræa Wislizeni.

Fig. 1, a flower, magnified; fig. 2, the pistil, more enlarged; fig. 3, a ripe pod, with one cell opened, to show the seed—also magnified; fig. 4, the embryo, more magnified.

Plate III. Geranium Fremontii.*

Plate IV. Hoffmanseggia Jamesii.

Fig. 1, a flower; fig. 2, a pod; fig. 3, seed—all moderately magnified.

Plate V. Sanguisorba annua.

Fig. 1, a flower; fig. 2, the fruit—both magnified.

Plate VI. Eryngium diffusum.

Fig. 1, a separate leaf; fig. 2, a flower; fig. 3, a petal; fig. 4, the ovary, with the styles and three of the sepals; fig. 5, front view of a stamen and sepal; fig. 6, side view of the same—all but fig. 1 more or less magnified.

Plate VII. Eurytænia Texana.

Fig. 1, a mericarp, magnified; fig. 2, transverse section of the same, more magnified.

Plate VIII. Liatris acidota.

Fig. 1, head of flowers, moderately magnified; fig. 2, a single flower, more enlarged; fig. 3, a single bristle of the pappus, still more enlarged.

Plate IX. Aphanostephus ramosissimus.

Fig. 1, a ray-flower; fig. 2, a disk-flower; fig. 3, style of the same; fig. 4, achenium, with its coroniform pappus—all magnified.

Plate X. Xanthisma Texana.

Fig. 1–3, scales of the involucre; fig. 4, a disk-flower; fig. 5, achenium and pappus of the same; fig. 6, ray-flower; fig. 7, style of the disk-flower—all magnified.

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* This species was not found by Captain Marcy, but it grows in the region that he explored. The plate was prepared for another government report, which was never published.

Plate XI. Engelmannia pinnatifida.

Fig. 1, a ray-flower, with an inner involucral scale; fig. 2, style of the same; fig. 3, a disk-flower; fig. 4, style of the same; fig. 5, an achenium—all magnified.

Plate XII. Artimesia filifolia.

Fig. 1, portion of a flowering branch, moderately enlarged; fig. 2, a single head, more magnified; fig. 3, the same, longitudinally cut and equally magnified; fig. 4, a disk-flower, and fig. 5, a ray-flower, both more magnified.

Plate XIII. Erythræa Beyrichii.

Fig. 1, a flower, magnified; fig. 2, a capsule.

Plate XIV. Heliotropium tenellum.

Fig. 1, the calyx; fig. 2, corolla, showing its æstivation; fig. 3, the same, expanded; fig. 4, the same, laid open; fig. 5, fruit; fig. 6, longitudinal section of the seed—all magnified.

Plate XV. Euploca convolvulacea.

Fig. 1, a flower, moderately magnified; fig. 2, the same, aid open and equally magnified; fig. 3, the stamens, more magnified; fig. 4, a single stamen, still more magnified; fig. 5, the pistil, equally magnified; fig. 6, fruit, with the persistent style; fig. 7, transverse section of the same, equally enlarged; fig. 7, longitudinal section of a seed, more magnified.

Plate XVI. Pentstemon ambiguus.

Fig. 1, a flower, moderately magnified; fig. 2, the stamens and a portion of the corolla, more enlarged; fig. 3, the pistil, equally magnified; fig. 4, capsule, twice the natural size, and dehiscent.

Plate XVII. Lippia cuneifolia.

Fig. 1, a bract; fig. 2, a flower; fig. 3, the calyx; fig. 4, the corolla, cut longitudinally, showing the stamens and pistil—all moderately magnified; fig. 5, the pistil, longitudinally cut, more enlarged.

Plate XVIII. Abronia cycloptera.

Fig. 1, involucre, somewhat magnified; fig. 2, fruit of the natural size; fig. 3, transverse section of the fruit, magnified; fig. 4, an achenium, magnified; fig. 5, transverse section of the same, also magnified; fig. 6, the embryo.

Plate XIX. Poa interrupta.

Fig. 1, a spikelet; fig. 2, a single flower; fig 3, a caryopsis—all magnified.

Plate XX. Uniola stricta.

Fig. 1, a spikelet, magnified.

APPENDIX H.

ETHNOLOGY.

VOCABULARIES OF THE COMANCHES AND WITCHITAS, BY CAPT. R. B. MARCY; WITH SOME GENERAL REMARKS, BY PROF. W. W. TURNER.

APPENDIX H.

ETHNOLOGY.

VOCABULARIES OF WORDS IN THE LANGUAGES OF THE COMANCHES AND WITCHITAS: BY CAPT. R. B. MARCY.

ENGLISH.	COMANCHE.	WITCHITA.
Man,	To-e-*bitch*-e,	Two-bear-e-*kets*-ah.
Woman,	Wy-*e*-pe,	*Kah*-haak.
White man,	To-e-*titch*-e,	E-*ka*-rish.
Mexican,	Tack-o-*ti*-bo,	Es-*ta*-he.
Negro,	Toosh-ah-*ty*-bo,	Es-tah-he-*es*-co-rash.
Indian,		*Eh*-hos.
Delaware,		Nar-*wah*-ro.
Kickapoo,		Shake-*kah*-quah.
Cherokee,		*Shan*-nack.
Osage,	Wash-sashe,	*Wash*-sashe.
Comanche,		*No*-taw.
Chief,	Taak-*quin*-no,	A-*ra*-oh.
Friend,	Hartch,	Hartch.
Enemy,	To-ho-*ba*-kah,	Now-*ta*-wah.
One,		*Cha*-osth.
Two,		Witch.
Three,		*Taw*-way.
Four,		*Taalk*-witch.
Five,		Es-*quaw*-etch.
Six,		*Ke*-hash.
Seven,		Ke-*off*-itch.
Eight,		Ke-o-*taw*-wah.
Nine,		Sa-o-*kin*-te.
Ten,		Es-kir-ri-*ah*-wash.
Horse,	Pooke,	Ca-*wah*-ra.
Mule,	*Moo*-rur,	*Moo*-rur.
Bear,	*Whee*-lah,	Wee-rah.
Dog,	*Charl*-lee,	*Keetch*-ah.
Prairie-dog,	*Kee*-chee,	*Keeche*-n'ah.
Sun,	*Tah*-arpe,	*Kee*-shaw.
Moon,	Mushe,	Moir (like French).
Stars,	*Ta*-arche,	Eck-qua-*de*-co.
Water,	Pah,	Keetche.
Fire,	Koo-*o*-nah,	*Es*-tore.
Road,		To-yah-*atch*-co.

ENGLISH.	COMANCHE.	WITCHITA.
Smoke,	*Cook*-toe,	Etch-qua-*ask*-co.
River,	Ho-no,	Hat.
Mountain,	*To*-yah-vees-tah,	Ne-yaw-*caw*-tee.
Corn,	Hah-ne-*be*-tah,	Tais.
Grass,	Me-*cheese*-ka,	Ec-*yock*-cod.
Tree,	*Oho*-pee,	Cawk.
Blanket,	*Wah*-nopp,	Ah-*water*-cotsh.
Mirror,	*Nah*-bo-ne,	Atch-e-*o*-wash.
Paint,	*Pees*-ah-pee,	Tah-rah-*o*-way.
Tobacco,	*Pah*-mo,	*Way*-co.
Powder,	*Nah*-co-chee,	*Eteh*-cod.
Gun,	Pe-*i*-it,	Kah-*to*-kash.
Bow,	Ho-a-*ā*-te,	Kee-*sti*-its.
Arrow,	*Pa*-ark,	*Nay*-quats.
Yes,	Hah,	Wash.
No,	Kay,	Ke-*ah*-re.
To hear,	*Nah*-gut,	To-*otch*-kash.
To sleep,	*Ithe*-pe,	A-shotch-a-*show*-bick.
To come,	Keem-mah,	To-*ta*-os.
To go,	Me-ah-lo,	*Totch*-esch.
Fight,	Naw-bah-*da*-kah,	Ta-*a*-chots.
Understand,	*Hock*-kun-nee,	Wah-tah-chow-*otch*-kash.
Talk,	*Ta*-quaw,	Wash-talk-*ke*-shaw.
Look here,	Cab-*boon*,	Esh-*sha*-esh.
I see,		Un-*sha*-esh.
Tell them,	Marry-e-ah-whit-to,	*E*-shock.
He says,		*Talk*-kash.
How much?		*Atch*-kinch.
How far?		Ah-she-ka-atch-e-*a*-wah.
Good,	Chaat,	*Atch*-tah.
Bad,	*Tahe*-chit,	Naw-*out*-ta.
Great,	*Pe*-opp,	*Totch*-tah.
Small,	*Ter*-titche,	Kee-*etch*-tah.
Black,	*Too*-hop,	*Co*-rash.
Dead,	*Ta*-yeh,	Wah-*ta*-tash.
God,	Tar-*a*-pe.	
My father,	Ner-*ack*-pee.	
My mother,	Ner-*be*-ar.	
My brother,	Ner-*ta*-ma.	
My sister,	Ner-*pa*-cher.	
My son,	Ner-*too*-ar.	
My daughter,	Ner-*pa*-tar.	
My husband,	Ner-co-*mack*-pe.	

ENGLISH.	COMANCHE.	WITCHITA.
My wife,	Ner-quer.	
Child,	To-*a*-chee.	
Boy,	To-a-*nick*-pe.	
Girl,	Wy-ah-*pee*-chee.	
Face,	*Koo*-veh.	
Body,	*Wahk*-cher.	
Head,	*Pa*-aft.	
Heart,	*Pe*-hee.	
Breast,	*To*-koo.	
Hair,	*Par*-pe.	
Hand,	*Moo*-wah.	
Leg,	Ah-*too*-koo.	
Foot,	*Nah*-hap.	
Neck,	*Too*-yock.	
Eye,	*Naw*-chiche.	
Mouth,	Tep-pa.	
Tongue,	Ar-*ah*-ko.	
Back,	*Qua*-hee.	
Bone,	*So*-nip.	
Blood,	*Peeshe*-pah.	
Ear,	*Nah*-karke.	
Scalp,	*Pah*-pee.	
Buffalo,	*Cook*-chow.	
Ox,	Pe-mo-ro.	
Herd of horses,	Tah-*he*-yeh.	
Deer,	Ul-leek-kah.	
Turkey,	Ko-yo-*nit*-tah.	
Day,	Tah-arp.	
Summer,	*Ta*-arch.	
Winter,	*To*-han.	
Spring,	Tane-*hah*-ro.	
Night,	Too-*kah*-ra.	
Morning,	Pua-*arth*-co.	
Darkness,	Teir.	
Rain,	Er-mar.	
Snow,	Tar-kau.	
Sea,	Par-hap-hia.	
Prairie,	Pe-he-*wale*-te.	
Spring, (fountain,)	Pah-hap-pea.	
Bread,	Ta-e-*shaw*-tar.	
Melon,	Pe-*he*-na.	
Wood,	Koo-*oh*-nee.	
Forest,	Hoo-*oh*-carte.	
Bird,	*Hoo*-choo.	
Fish,	*Pa*-que.	

ENGLISH.	COMANCHE.	WITCHITA.
Snake,	Noo-*be*-er.	
Stone,	Terp.	
Lead,	*Nup*-parke.	
Pipe,	*Toh*-ish.	
Corn,	Hah-ne-*be*-teh.	
Tent,	Kah-*hah*-me.	
Wampum,	Tshe-nip.	
Kettle,	Way-he-*to*-wah.	
Boat,	Wo-we-*poke*.	
Axe,	Ho-*him*-nah.	
Spear,	Cheak.	
Knife,	Weith.	
Flint,	*Na*-da-curte.	
Shoe,	Ma-*a*-pee.	
Kettle,	*Wit*-wah.	
Town,	Kee-*nu*-kie.	
Warrior,	Too-a-vitche.	
Hot,	*Ur*-ate.	
Cold,	*Urtch*-ate.	
White,	*Too*-shop.	
Red,	A-*kop*-tee.	
Handsome,	Char-nar-bo-my.	
Live,	*Nay*-ure.	
Salt,	O-nae-*bit*-er.	
Near,	*May*-titch.	
Far off,	Ma-*nar*-kee.	
To-morrow,	Pa-*arch*-quee.	
To kill,	May-*way*-kun.	
To eat,	Tu-*kar*-roo.	
To walk,	*Her*-mumsh.	
To run,	No-*ka*-ark.	
To drink,	He-*bet*-to.	
To laugh,	Ta-*hah*-net.	
To cry,	*Tah*-kay.	
To love,	Kum-*mar*-pee.	
To trade,	Te-me-*ah*-row.	
To see,	Nah-*bo*-ne.	
To sing,	Ho-bee-er.	
To dance,	Ne-*er*-ker.	
Me,	Ne.	
You,	*Her*-che.	
He,	Sho-ku.	
They,	Pun-che.	
Very well,	*O*-shus-she.	
Perhaps,	Wo-har-*ke*-ne.	

REMARKS ON THE PRECEDING VOCABULARIES, BY PROFESSOR W. W. TURNER.

Of the two vocabularies here given, the *Comanche* agrees very closely with that obtained by Mr. Robert S. Neighbors, Indian agent in Texas, and published by H. S. Schoolcraft, in his History, Condition, and Prospects of the Indian Tribes, vol. II, p. 494, *et seq.;* the slight discrepancies which present themselves between the two being nearly all owing to the different manner in which the same sounds are caught and represented by different persons. The ethnological affinities of the Comanches are well known. They are the most important tribe of Indians in Texas, and constitute a portion of the great Shoshonee or Snake family, which have been led in pursuit of the buffalo far to the south of their congeners.

The vocabulary of the *Witchitas*, though less complete, is more interesting, as being the first ever published, as far as I am aware. A pretty extended examination, however, has not enabled me to discover an analogy between it and any other aboriginal tongue with which we have the means of comparison. It is true, that in Capt. Marcy's lists the words for *Osage*, *friend*, *mule*, *bear*, *prairie-dog*, are the same in this language as in the Comanche; but the entire dissimilarity of the two vocabularies in other respects, shows that the words in question must have been adopted from one language into the other, or from a common foreign source. Thus it is evident that the Comanche name for *prairie-dog* is borrowed from the Witchita, while the name for *mule* has been taken by both from the Spanish. The ethnological position of the Witchitas, then, remains still to be determined.

ALPHABETICAL INDEX.*

* Synonyms are italicised.