We omit here some specific discussion and description of this owl, which is known to modern ornithologists as Speotyto cunicularia, var. hypogaea. The narrative continues:

"In the plains about the encampment, were several natural mounds, greatly resembling some of the artificial works so common in the central portions of the great valley of the Mississippi. About the summits of these mounds were numerous petrifactions, which were found to be almost exclusively casts of bivalve shells, approaching the genus Cytherea, and usually from one half to one and a half inches in diameter.*

F. W. Cragin

*These are the noted "wigwam buttes" or "tepee buttes" of the Fort Pierre Cretaceous shales of Fountain creek and Arkansas river valley. They ~~have described under the name "tepee buttes" by Professor G.K. Gilbert of the United States Geological Survey~~ are from 25 to 60 feet high, and conspicuous for their conical symmetry. Centrally each has a limestone core, ~~which seems to represent the persistence through a considerable period of time of a local colony of shells in the old Cretaceous ocean.~~ The bivalve which Doctor James compares to Cytherea, and which is the most characteristic form found in the cores and weathering out at the summits of the mounds, is Lucina. See also footnote on tepee buttes, under date of July 20th. — F.W.C.

"On the evening of the 15th, finding all our stock of meat injured by too long keeping, four men were sent out on horseback to hunt. At the distance of six miles from camp, they found a solitary bison, which they killed, but concluding from its extreme leanness and the ill savour of the flesh, that the animal was diseased, they took no part of it. On the following morning they returned unsuccessful. We were now reduced to the necessity of feeding on our scanty allowance of a gill of parched maize per day to each man, this being the utmost our limited stores would afford.

"On the 16th of July, we moved from our encampment on Boiling-spring creek, in a southwestern direction to the Arkansa. This ride of 28 miles, which we finished without having once dismounted from our horses, occupied about ten hours of a calm sultry day, in every respect like the preceding, in which the thermometer in the shade had ranged from 90° to 100°. Our route lay across a tract of low but somewhat broken sandstone of an uncommon slaty structure. It is fine-grained, with an argillaceous cement, and of a light gray or yellowish-white colour. It contains thin beds of bituminous clay slate, and we saw scattered on the surface some small crystals of Selenite. It is traversed by numerous deep ravines in which at this time not a drop of water was to be found.

"The soil is scanty and of incurable barrenness. The texture of the rock is so loose and porous as to unfit it for retaining any por-

tion of the water which falls upon it in rains. A few dwarfish cedars and pines are scattered over a surface of loose dusty soil intermixed with thin lamellar fragments of sandstone, and nearly destitute of grass or herbage of any kind. Our sufferings from thirst, heat, and fatigue were excessive, and were aggravated by the almost unlimited extent of the prospect before us, which promised nothing but a continuation of the same dreary and disgusting scenery. Late in the afternoon we arrived at the brink of the precipice which divides the high plains from the valley of the Arkansa. This is here narrow, and so deeply sunk in the horizontal sandstone, that although there are trees of considerable size growing along the river, they do not rise to the level of the surface of the great plain, and from a little distance on either side, the valley is entirely hid. Here our thirst and impatience were for some time tantalized with the view of the cool and verdant valley and copious stream of the Arkansa, while we were searching up and down for a place where we could descend the precipice.

"At length, a rugged ravine was discovered down which we with some difficulty wound our way to the base of the cliff, where lay a beautiful level plain, having some scattered cottonwood and willow trees, and affording good pasture for our horses. Here we encamped, and the remainder of the afternoon was spent in making preparations to despatch a small party up the Arkansa to the mountains on the succeeding day.

"A small doe was killed near camp, which, though extremely lean, proved an important addition to our supply of provisions.

"The place where we encamped was supposed to have been near where Pike's blockhouse formerly stood, but we sought in vain for the traces of any thing resembling the work of a white man."*

This camp, being 30 miles below the mountains, as stated in the narrative, and 28 southwesterly miles from the observation camp on Fountain creek, must have been a little below the mouth of Turkey creek, the route of this second advance from Fountain creek, being more southerly and less westerly than that made on the former occasion. The longitude given for it in the table, indicates a position much west of the Royal Gorge, and is evidently quite erroneous.

Here, most of the party remained encamped from the evening of the 16th until the morning of the 19th; hunting, making natural history collections, etc., and affording a party of four time to visit the border of the mountains to the westward for geological and other observations.

"On the morning of the 17th, says the narrative, "Captain Bell, with Dr. James and two men, left the encampment of the party, proposing to

*This supposition was of course erroneous, and the search needless; for Pike in his journal, makes it perfectly plain that the only blockhouse he built on the Arkansas, was at present Cañon City, and that his only other wooden structure on that river, was a breastwork five feet high on three sides and the other thrown on the river, and was built of "1/4 logs," near the mouth of Fountain creek. — F.W.C.

ascend the Arkansas to the mountains. They were furnished with provisions for two days, according to the scanty allowance to which we were reduced.

"The river valley was found so narrow, and so obstructed by the timber and the windings of the stream, as greatly to obstruct the travelling. We therefore resolved to leave it, and pursue our journey in the open plain at a distance from the river. The course of the Arkansa for the first twenty miles from the mountain, is but little south of east. It enters the plain at one extremity of an extensive amphitheatre formed by the continued chain of the mountains on the west and northwest and by the projecting spur which contains the High Peak [Pike's Peak] on the east. This semicircular area is about thirty miles in length from north to south and probably twenty wide at its southern extremity. The mountains which bound it on the west are high, and at this time were partially covered with snow.

"The surface of the area is an almost unvaried plain, based on a stratum of argillaceous sandstone.* Near the foot of the mountain

*Of Cretaceous age, and known to present geologists as the Dakota sandstone. — F.W.C.

the same sandstone is observed resting in an inclined position against the primitive rocks.* It forms a range like that already

*A series of crystalline rocks, then supposed to be exclusively confined to a position beneath the oldest or lowest fossil-bearing strata, and to represent "portions of the primeval crust of the globe — traces of the surface that first congealed upon the molten nucleus", were by geologists in the early part of the nineteenth century, known as "Primitive". It was thus substantially the equivalent of the series known more recently as Azoic or Archaean. As a synonym of "Primitive", the term "Primary" was sometimes used; and both terms were sometimes employed to designate both the strictly so called Archaean and those which are today distinguished as Algonkian; the former including chiefly the granites, and the latter including such types as schists, slates, crystalline limestones, etc., rocks which often show traces of their origin from sedimentary strata by metamorphic processes, and which in rare cases contain more or less distinct traces of organic remains. The word Primary, however was more commonly used for the oldest division of stratified rocks in that classification which divided them into Primary, Transition, Secondary, Tertiary, and Quarternary; the Primary rocks including all slaty and crystalline rocks, supposed unfossiliferous, such as roofing-slate, mica-schist, and gneiss, —being practically the now so-called Algonkian —; the Transition including strata of slaty and siliceous sandstones, known as "Greywacke", and calcareous shales and limestones, and containing, as was supposed, "few or no fossil plants and the remains of no higher animals than crustacea, shell-fish, and zoöphytes", and being thus equivalent to Cambrian, Ordovician and Silurian; the Secondary including all the stratified systems from the Old Red Sandstone (Devonian) to the Chalk (Cretaceous), in all which vertebrate as well as invertebrate animal remains occurred, but of forms largely quite different from those now existing; the Tertiary, and Quarternary, comprising these systems substantially as known today, with modern types of animal and plant remains. It is now, however, well known that granite

and the crystalline and metamorphic rocks are not confined to the Archaean and Algonkian respectively, nor to both, but may be found among rocks of any age, though less common in the later. Nor are the rocks which were called Primary in the above scheme, wholly devoid of organic remains. Subsequent to the time when the above scheme of rock-classification was in use, the term, Primary, came to be used by many geologists as an equivalent of Palaeozoic, and the term, Secondary, as a synonym of Mesozoic. The succession of rocks which Doctor James here calls "primitive", and against which he observed the Dakota sandstone resting, includes both Palaeozoic and Algonkian, with one important member of the Mesozoic.

mentioned when speaking of the mountains at the Platte, separated from the primitive by a narrow valley. On entering this valley, we found the recent trace of a large party of Indians travelling with skin lodges, who appeared to have passed within a very short time. This trace we followed until we found it entered the mountains in the valley of a small stream which descends to the Arkansa from the northeast. This [valley] we left on the east, and, traversing a rough and broken tract of sandstone hills, arrived, after a toilsome journey of about thirty miles, at the spot where the Arkansa leaves the mountains."*

*The Doctor's itinerary here, is not altogether clear and satisfactory. The narrow valley in which the Indian trail was found, and which was said to separate the ridge, or range, of inclined sandstones (the now so-called Dakota hog-back) from the "primitive" (i.e., Paleozoic and Algonkian) rocks, was, of course, that of Sand creek. Northward up this, today, for several miles, and then northwestward, into the mountains, to Currant creek, South Park, etc., leads a road which sends a branch also to Parkdale. Sand creek comes from the north. There is in this vicinity no "small stream which descends to the Arkansa from the northeast"; and instead of the latter direction, northwest was probably intended. — F. W. C.

"Here we found several springs whose water is impregnated with muriate of soda and other salts. They rise near each other in a small marshy tract of ground occupying the narrow valley of the river at the point where it traverses the inclined sandstone ridge. Very little water flows from them, and the evaporation of this has left a crystalline incrustation whitening the surface of the surrounding marsh. The springs are small excavations, which may perhaps have been dug by the Indians or by white hunters. They appear to remain constantly full; they all contain muriate of soda, and the smell of sulphuretted hydrogen is perceptible at a considerable distance from them. They differ in taste a little from each other; hence the account given of them by hunters, that one is sour, another sweet, a third bitter, and so on. One contains so much fixed air [carbonic acid gas] as to give it considerable pungency, but the water of all of them is unpalatable. The sweetish, metallic taste observed in the water of one or two, appears to depend on an impregnation of sulphate of iron,

- "The sulphate of magnesia and soda will probably be found to exist in these springs, if their water should hereafter be analyzed; they may also be found to possess some active medicinal properties. They are seven in number, and have received the name of Bell's springs, in compliment to their discoverer. Though the country around them abounds with bisons, deer, &c., they do not appear to be frequented as most saline springs are, by these, or other herbivorous animals".

A much briefer description of these springs was written by Captain Bell himself, as official journalist of the expedition; this was copied and published, with several other extracts from the Captain's journal, by Reverend Jedidiah Morse, D.D., in 1822, in the latter's "Report to the Secretary of War of the United States, on Indian Affairs", and is as follows:

"Head Springs of the Arkansaw river.— This river issues from a perpendicular rock, near which are six remarkable springs, issuing from the earth within the area of a rod square. Their waters are highly impregnated with different mineral substances. The surrounding soil, from the banks of the stream, a distance of about one hundred yards, produces grass of various species".*

*The statement, "This river issues from a perpendicular rock", is a description of the Royal Gorge of the Arkansas both laconic and original, and one which, unless it had read, "from between two perpendicular rocks", could hardly have been surpassed for sheer truthfulness. That Bell mentions but six springs— emphasizing the number —, which were "within the area of a rod square", while James mentions seven, one of which "contains so much fixed air as to give it considerable pungency," is possibly explained by the Captain having described only the compact group now combined in one and known as the Hot Spring, on the south side of the river, while the Doctor included also in the number the carbonated spring north of the river, and described them as being where the river traverses the inclined sandstone ridge, since the two occurrences were respectively west and east of the hogback. True, the very-small-scaled map of the expedition, legends "Bell's Springs" on the north side of the river; but this counts for little, if the mapping in this instance is no more accurate than that of the camp of July 12th to 15th, in which an important observation camp near the destined site of Fountain village, is mapped as being in the fork between Monument and Fountain creek, the position of West Colorado Springs or parent Colorado City. As these observers make no mention while they must have known Bell's Springs, they perhaps supposed it due to the midsummer exposure of the water to the sun in shallow marsh excavations. If, however, Doctor James saw and tasted the delicious spring north of the river, it is rather strange that he should have pronounced all of the waters unpalatable.

The narrative of Doctor James continues:

"It was near sunset when Capt. Bell and his party arrived at the springs, and being very much exhausted by their laborious march, they immediately laid themselves down to rest, under the open sky, deferring their examinations for the following morning.

"The sandstone near the springs is hard, though rather coarse, and of a dark gray, or brownish-yellow colour.

"In ascending the Arkansa on the ensuing morning, we found the rock to become more inclined, and of a redder colour, as we approached the primitive, until at about half a mile from the springs, it is succeeded by the almost perpendicular gneiss rock, which appears here at the base of the first range of the mountains.* We have noticed that

Footnote

*Doctor James here uses the term, primitive, in a stricter sense than in his first use of it in connection with this vicinity, applying it to the gneisses and schists of the Royal Gorge, and hence in the sense of Pre-Palaeozoic.—F. W. C.

this particular spot is designated in the language of the hunters, as "the place where the Arkansa comes out of the mountains", and it must be acknowledged the expression is not entirely inapplicable. The river pours with great impetuosity and violence through a deep and narrow fissure in the gneiss rock, which rises abruptly on both sides to such a height as to oppose an impassable barrier to all further progress. According to the delineation of Pike's route on the map which accompanies his work, he must have entered the mountains at this place; but no corroboration can be derived from his journal. It appears almost incredible that he should have passed by this route and neglected to mention the extreme difficulty which must have attended the undertaking."*

Footnote

*Pike's map is entirely consistent with his journal in showing that, in twice entering the mountains from a point on the Arkansas below Grape creek, in the vicinity of Canon City, he did so in the first instance by a northerly route to South Park and the head waters of the Arkansas, and in the second by a southerly one, to and along the west slope of the Sierra Mojada, through Wet Mountain valley. Only the map-trace of his return from the northern excursion might, but for the small scale of the map, and but for the text, possibly be taken to imply that in coming down the Arkansas, he passed through the Royal Gorge; but his journal details clearly his attempt and failure to do this, and the consequent return of himself and part of his men by a northerly hill-scrambling detour, and the remainder of them around by a southerly route which they reported as "quite an eligible pass" and which was the old Ute pass and trail, destined to become noted as the scene of a running fight between white soldiers and fleeing Utes half a century later, and to be marked by many stone-heaps, or Indian graves, which, long after the founding of Canon City, were annually decorated with evergreens by the red men in token of mourning for their slaughtered loved ones.—F. W. C.

"Captain Bell and his party returned to the encampment of the main