

cardinalibus parvis, acuminate, crenulatis, in utroque valvulo duplicibus; lateralibus longis, lamellatis rectisque; margaritâ albâ et valdè iridescente.

Hab.—Tennessee River, at Florence, Alabama. B. Pybas.

UNIO NEUSENSIS.—Testâ lævi, oblongâ, subcompressâ, ad laterè planulatâ posticè tumidâ et biangulatâ, valdè inæquilaterali; valvulis subcrassis natibus prominulis; epidermè nigricantè, striatâ et eradiatâ; dentibus cardinalibus parviusculis, crenulatis, in utroque valvulo subduplicibus; lateralibus prælongis subcurvisque; margaritâ vel purpureâ vel salmonis colore tinctâ et iridescente.

Hab.—Neuse River, six miles from Raleigh, N. C. Prof. Emmons.

UNIO PURUS.—Testâ lævi, ellipticâ, subcompressâ, posticè rotundatâ, inæquilaterali; valvulis subcrassis, anticè spissatâ; natibus subprominentibus; epidermide luteo-olivâ, glabrâ, ad umbones politâ, obsoletè radiatâ; dentibus cardinalibus submagnis, acuminate, crenulatis, in utroque valvulo subduplicibus; lateralibus sublongis, lamellatis subcurvisque; margaritâ albâ et iridescente.

Hab.—Neuse River, six miles from Raleigh, N. C. Prof. Emmons.

UNIO EXACTUS.—Testâ lævi, ellipticâ, compressâ, posticè rotundatâ, inæquilaterali; valvulis subcrassis; natibus prominulis; epidermide tenebroso-rufâ, striatâ; dentibus cardinalibus parviusculis, crenulatis, in utroque valvulo duplicibus, lateralibus sublongis, lamellatis subrectisque; margaritâ albâ et iridescente.

Hab.—Neuse River, six miles from Raleigh, N. C. Prof. Emmons.

Descriptions of a New Helix and Two New Planorbes.

BY ISAAC LEA.

HELIX CLARKII.—Testâ supernè rotundatâ, infernè plano-convexâ, regulariter striatâ, brunneo-corneâ, imperforatâ, unodontatâ: anfractibus septenis, obliquè striatâ; aperturâ lunatâ, subdilatâ; labro albido, reflexo, infernè calloso; columellâ in medio uno-dentatâ, ad basim impressâ.

Hab.—Tuskee Cove, Cherokee County, North Carolina. Prof. D. Christy, Hamilton, Ohio.

PLANORBIS WHEATLEYI.—Testâ parvâ, tenebroso-corneâ, planulatâ, obsoletè striatâ, bicarinatâ, supernè depressâ, infernè latè et profunditè umbilicatâ; anfractibus quinis, supernè obtusè carinatâ, infernè acutè carinatâ; aperturâ albidâ, crassâ et valdè constrictâ, intus sexdentatâ.

Hab.—Cotoma Creek, Montgomery County, Alab. C. M. Wheatley.

PLANORBIS NEWBERRYI.—Testâ pallido-corneâ, depresso-turritâ, minutissimè striatâ, supernè et infernè acuto-carinatâ, latè et profunditè umbilicatâ; anfractibus quinis, planulatis; aperturâ magnâ, pallido corneâ, subtriangulari.

Hab.—Klamath Lake and Canoe Creek, California. J. S. Newberry, M. D.

Descriptions of New Organic Remains collected in Nebraska Territory in the year 1857, by Dr. F. V. Hayden, Geologist to the Exploring Expedition under the command of Lieut. G. K. Warren, Top. Engr. U. S. Army, together with some remarks on the Geology of the Black Hills and portions of the surrounding Country.*

BY F. B. MEEK AND F. V. HAYDEN.

After leaving the great area of comparatively low country composed of nearly horizontal Tertiary and Cretaceous formations, lying between the Missouri and the Black Hills, the geologist, on approaching the latter, soon begins to see in

*WASHINGTON, D. C., March 1, 1858.

Capt. A. A. Humphreys, Top. Eng. in charge Off. Expl'n and Surveys.

SIR: The accompanying paper, by Messrs. F. B. Meek and F. V. Hayden, descriptive of New Organic Remains discovered by the exploration in Nebraska, organized by the War Department and placed under my command in May last, 1858.]

the disturbed condition of the strata over which he is passing, unmistakable evidences that the hills looming up before him are not merely elevations left by the denudation of the surrounding country, but monuments of the former action here of those powerful subterranean forces which have played so important a part in modifying the earth's physical features.

First, in passing from the undisturbed overlying Miocene formation, we come directly upon No. 5, or the upper member of the Cretaceous series of the north-west, as subdivided in the published sections of the Nebraska formations. Then in regular succession Nos. 4, 3, 2, and 1, are passed over, all dipping sometimes at a high angle away from the Black Hills.* Beyond, and coming up from beneath No. 1, an older series of very similar strata, containing many organic remains, which we regard as Jurassic types, is passed over, as we ascend the hills. Then we have some fine red gypsum bearing deposits, separated by a bed of limestone containing a few fossils like Coal measure forms.

Next comes a group of well-marked Carboniferous formations, which repose upon a reddish and grayish sandstone of the same age as the Potsdam sandstone of the New York system,—all of which were often seen highly inclined, and apparently conformable. The Potsdam, in its turn, was met with, some-

with remarks in relation to the Geology of the Black Hills, has been prepared for the purpose of being read at the next meeting of the Academy of Natural Sciences in Philadelphia, and I therefore, beg leave to ask the authority of the Department thus to dispose of it.

The region embraced by these Black Hills lies mainly between the north and south forks of the Shyenne River, and north-west of the well-known Mauvaises Terres of White River. Everything relating to it has hitherto been most imperfectly understood. Situated remote from the great lines of travel to the Pacific, and inhabited by brave and numerous warriors of the Dakota nation, determined to resist the encroachments or intrusions of white men, it has remained an unknown land, especially to scientific men, whose pursuits are viewed by the Indians with superstitious apprehension. Even the trappers and traders have generally avoided this dangerous locality, and hence the most erroneous ideas have been entertained of the position, direction, extent, and formation of these so-called Hills.

Our exploration of the past year has, however, in a great measure settled these points. We now know them to be a detached portion of the great upheaved mountain mass occupying the western portion of the territory of the United States, and the most eastern part of it yet discovered. They form an assemblage of mountain elevations lying between the meridians of $103^{\circ} 15'$, and $104^{\circ} 45'$, west from Greenwich, and between the parallels of $43^{\circ} 20'$ and $44^{\circ} 45'$ north latitude, the general deviation of the upland being about N. 20° W. The highest peaks are elevated about 6700 feet above the level of the sea, and from 500 to 4500 feet above the surrounding country.

The geological discoveries which the exploration has made are of much value to science, and the announcement of a few of the most important ones is the object of the paper herewith submitted. Mr. Meek has co-operated with Dr. Hayden in elaborating the results from the materials collected, without any pecuniary recompense from the government, Dr. Hayden being the Geologist to the expedition.

Very respectfully your ob't serv't,

G. K. WARREN, Lt. Top. Engrs.

The above letter, and accompanying paper, have been submitted to the Secretary of War. Their communication to the Academy of Natural Sciences is authorized.

A. A. HUMPHREYS,

March 1, 1851.

Capt. Topl. Engrs. in charge of Office &c.

* We should state here that the Tertiary beds were also often seen in the form of outliers, reposing unconformably on several of the older rocks, even down to the Carboniferous, near the south base of the Black Hills.

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times far up on the higher points of the mountain, resting unconformably upon the upturned edges of what appears to be a series of very ancient, highly metamorphosed sedimentary strata, standing vertical. Beyond and beneath the latter, the main body of the mountains seems to be made up of a coarse feldspathic granite, composed of large crystals of feldspar, with very small proportions of quartz and mica. This granite, and portions of the adjacent strata, were often seen traversed by various veins, dikes, and larger outbursts of basaltic and other eruptive rocks.

In order that our remarks may be more clearly understood, we give below a general vertical section of the rocks seen in the Black Hills and around their base, showing their order of succession, and approximate thickness. It is not, of course pretended that all these formations were seen lying in contact at any one locality; but they were often met with, under such circumstances, and holding such relations, as to leave little room to doubt that this is their true order of superposition.

General Section of the Geological Formations seen in and near the Black Hills (descending).

1st. Miocene beds consisting of whitish clays and sandstones of various thickness.

- Cretaceous System.
- No. 5. Of the Nebraska general section, with its usual characters and fossils—150 ft.
 - No. 4. Presenting its usual characters and containing its characteristic fossils,—150 feet.
 - No. 3. Usual fossils and composition,—150 to 200 ft.
 - No. 2. Usual lithological characters and fossils, with some new forms,—200 to 250 ft.
 - No. 1. Upper part yellowish and reddish sandstone, sometimes in heavy beds, passing down into alternations of yellowish, gray, bluish, and reddish laminated shale, with seams and layers of dark carbonaceous matter, or impure lignite; beneath which there is a heavy bed of compact yellowish and reddish sandstone, with indistinct vegetable remains, and much fossil wood,—above beds variable at different places,—300 to 400 ft.

Then come alternations of light gray argillaceous grit, and rather soft sandstone, containing *Ammonites Henryi*, n. s. p., and a small oyster; also in bluish gray compact argillo-calcareous masses *Unio nucalis* n. s. p., and a small *Planorbis*, with other small univalves like *Paludina*.

- Jurassic System.
- A.—Layers of argillo-calcareous, somewhat gritty mass, containing *Belemnites densus*, n. s. p., *Ammonites cordiformis*, n. s. p., *Avicula (Monotis) tenuicostata*, n. s. p., *Arca (Cucullæa) inornata*, n. s. p.; passing down into a 6 or 8 foot bed light gray, or yellowish sandstone, with ripple marks and trails of marine worms, 50 to 80 ft.
 - B.—Light red argillo-calcareous gritty bed, with greenish seams, and nodules (sometimes wanting,)—30 to 40 ft.
 - C.—Soft gray and dark brownish sandstone, passing down into about 8 feet of laminated shale of various colors, below which there is a 6 foot bed of sandstone similar to that above, containing *Avicula tenuicostata*, and trails of marine worms. Then comes 30 to 40 feet of bluish, or ash-colored argillaceous shale, with great numbers of *Lingula brevirostra*, n. s. p., and *Serpula*. Next we have a light-gray calcareous grit, containing columns of *Pentacrinus asteriscus*, n. s. p., *Avicula tenuicostata*, *Serpula*, &c., the more compact and calcareous portions often perforated by *Pholas*? The latter bed passes down into a light-yellowish gray sandstone, splitting into thin layers, and containing imperfect casts of *Mytilus (Modiola)*, *Pecten*, *Trigonia*, and other bivalves, in considerable numbers. Whole 60 to 100 ft.

- Carboniferous System.
- D.—Brick-red, incoherent, argillo-calcareous, very fine slightly gritty material, containing great quantities of gypsum in the form of seams, layers, and irregular beds,—100 to 150 ft.
- E.—Bluish and reddish gray, very hard gritty limestone, in which were found a smooth *spirifer*-like *S. lineatus*, two or three species small *Pleurotomaria*, two species *Macrocheilus* and one or two species of *Bellerophon*. This bed is variable in thickness,—10 to 50 feet.
- F.—Brick-red material, very similar to the bed D, excepting that it contains much less gypsum; passing down into a very hard compact concretionary sandstone,—250 to 300 ft.
- G.—Hard, more or less gritty, yellowish and whitish limestone, containing *Productus*, *Spirifer*, *Euomphalus*, &c. &c., passing down into a light-yellow calcareous grit; altogether 50 ft.
- H.—Very hard reddish-gray limestone, containing *Syringopora*, *Productus*, *Terebratula*, &c. In the middle of this bed there is an 8 foot layer of very hard compact bluish limestone containing many crinoid remains, whole 50 ft.
- Oldest Silurian.
- I.—Potsdam sandstone, containing *Lingula*, *Obolus?* and fragments of *Trilobites*,—30 to 50 ft.
- J.—Highly metamorphosed strata, standing vertical.
- K.—Coarse feldspathic granite, forming mountain masses.

The upper beds of the foregoing section, as seen along the Missouri, and in other portions of Nebraska, having been described on former occasions, and presenting few important new features, in the region of the Black Hills, we pass, for the present, at once to the consideration of those below, beginning with No. 2. This formation, it will be observed, augments greatly in volume towards the west, its thickness along the Missouri, above the mouth of Big Sioux River, having been generally estimated at about ninety feet, while here, near the Black Hills, it attains a thickness of two hundred feet. As it appears to be entirely wanting on the Missouri, near Judith River above Fort Union, and is found to diminish rapidly as we ascend the Big Sioux from the Missouri; while there are many facts pointing to the conclusion that it is one of the main fossil bearing beds of the Cretaceous series in Texas and New Mexico, we may reasonably infer that the sediment of which it is composed came originally from some source far to the southwest.

Lithologically this formation presents much the same characters near the Black Hills as along the Missouri, being composed of dark gray laminated clays. Several of its characteristic fossils were also found near the S. E. base of the Black Hills amongst which we recognise *Ammonites percarinatus* (Hall and Meek), of much larger size than those usually obtained along the Missouri, and numerous specimens of a *Cytherea*, perhaps identical with *C. tenuis* (Hall and Meek). Some interesting new forms were likewise found associated with the foregoing, amongst which there is a large *Ammonite*, having septa somewhat like those of *A. placenta*, but rounded on the dorsum; and a large strongly costated *Ammonite*, with very prominent nodes along the dorso-lateral margins, apparently very similar to a species described by Drs. Evans and Shumard under the name of *A. Galpinanus*; also a new species of *Scaphites*, closely related in the structure of its septa to *S. hippocrepis* of Dr. Kay.

It will be remembered, we have in all our published papers, when speaking of that portion of the Nebraska section composing No. 1, expressed doubts respecting its age. We placed it provisionally as the basis formation of the Cretaceous series, but at the same time stated it was "not positively known to belong to the Cretaceous system." In our last paper on the Nebraska formations, and their parallelism with those of the States, and the far southwest, communicated to the Academy in May, 1857, after having given all the facts in our possession bearing on this point, we stated that "although the weight of evidence

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thus far favors the conclusion that this lower series (No. 1) is of the age of the Lower Green sand, or Neocomian of the old word, we yet want positive evidence that portions of it may not be older than any part of the Cretaceous system."

Although we have little direct additional evidence at this time in regard to the age of this series, as we have always understood it, we now know that from beneath its lower beds, around the base of the Black Hills, there rises a series of very similar strata, as may be seen by the foregoing section, separated from its base by no well-marked line of demarkation, and containing many fossils closely similar to those considered characteristic of the Jurassic system of the old world. At the same time we have failed to recognize amongst these fossils any forms peculiar to the Cretaceous epoch, or even very nearly analogous to species common in rocks of that age.

The formations above alluded to as containing Jurassic types of fossils, are marked in the foregoing sections A, B, and C inclusive. But as before stated, these beds often pass so gradually, in their lithological characters, into No. 1 above, and so few fossils have been found near the junction, that we confess we have but a vague and indefinite idea in regard to the particular horizon at which the line should be drawn between them. Indeed, the general aspect of No. 1, and that of the formations below, are so very similar, and they are all so unlike the beds above, that if we were to classify them by their lithological characters alone, we should be inclined to view No. 1, and formations A, B, and C as forming one natural group, or at least to think that portions of No. 1, as we now understand it, should be classed with the series below. This view also appears to be the more reasonable when we take into consideration the great thickness of No. 1 in the vicinity of the Black Hills, and the fact that the beds A, B, and C contain a group of fossils apparently more nearly related to lower than upper Jurassic forms.

Inasmuch, however, as numerous leaves beyond a doubt belonging to dicotyledonous trees, closely analogous to the oaks, willows, and other existing forest trees, are known to occur in No. 1 along the Missouri, near the Big Sioux, and in northeastern Kansas,* and we have a *Baculite* from similar beds, apparently of the same age, near the mouth of Judith River, on the upper Missouri,—while we also learn from the letters and notes of our deceased friend, Mr. Henry Pratten, that he saw a species of *Baculite* in formations presenting the same characters, and seeming to occupy the same position, along the Platte above Fort Laramie, we think we hazard little in viewing at least a considerable portion of No. 1 as belonging to the Cretaceous system.

Another fact favoring the opinion that No. 1, even down as low as we have provisionally carried it in the Black Hills section, probably belongs to the lower Cretaceous, is the occurrence at its base of a bed containing *Ammonites* and *Ostrea*, along with *Unio*, *Planorbis*, and *Paludina*; an association of fossils which, in that position, carries the mind rather to the Wealden than to older formations.

The occurrence of these forms at this horizon, also leads us to suspect that a considerable portion of the estuary beds at the mouth of Judith River, above Fort Union, in regard to the age of which we have been so much puzzled, may be, as first suggested by Dr. Leidy, a representative of the Wealden, and as we were then inclined to suppose, belong to our No. 1.

The close similarity between the lithological characters of these deposits, and those of some of the Tertiary formations of the north-west, and the estuary character of their fossils, together with the analogy of many of the species of mollusca found in one of the upper beds, (which may be an outlier of Tertiary resting on older formations), taken in connection with the fact that amongst the fossils collected from one of the middle beds (see section, page 124, vol. viii. Proceedings, 1857,) there were some fragments of a *Trionyx*, regarded by Dr. Leidy as identical with a species occurring in well-marked Tertiary deposits near Long

* We are indebted to Maj. Hawn for our knowledge of the occurrence of these leaves in No. 1, as seen in Kansas.

Lake, below Fort Clark, led us subsequently to think the whole of these estuary beds, near the Judith, might possibly be only an outlier of Tertiary reposing upon deposits of the age of our No. 1. At the same time, in consequence of the occurrence in them of remains regarded by Dr. Leidy as analogous to *Lepidotus*, *Iguanodon*, and *Megalosaurus*, we stated that "in the midst of evidence of such a conflicting nature, it is unsafe to express any very positive opinion respecting the age of these formations."

Since we know that there is a similar group of beds at the base of No. 1, as we now understand it, near the Black Hills, containing a mingling of freshwater and marine fossils, although we are not sure any of them are specifically identical with those found near the Judith, we are inclined to think our first views in regard to these Judith River formations will prove to be correct, or in other words, the beds from which the saurian remains, described by Dr. Leidy, were obtained, will yet prove to be a part of the series we include in No. 1 of the Black Hills section. This view receives additional support, too, from the fact that the Judith River freshwater or estuary formations were often seen much upheaved and distorted, while around the Black Hills the Tertiary deposits appear to lie undisturbed upon the upheaved older rocks, in such a manner as to indicate that the last period of disturbance amongst the strata of this region occurred after the close of the Cretaceous epoch, but previous to the deposition of the Tertiary.

The evidence pointing to the conclusion that formations A, B, and C of the foregoing section should be regarded as probably Jurassic, is, first, the affinities of their organic remains; and secondly, their stratigraphical position. It is true we do not pretend to have recognized in these deposits any genera peculiar to the Jura; but at the same time we have failed to identify amongst these fossils any species belonging to genera limited in their range to the Cretaceous system; while in their specific relations, so far as we have been able to make comparisons, they are nearly all much more closely allied to Jurassic than Cretaceous forms, if not indeed actually identical with the former in some cases. This will, perhaps, be better understood by the following comparisons of some of the species described in this paper, from these formations:—

1st. *Pentacrinus asteriscus*, n. s. p., from near the lower part of formation C, is so nearly like the Liassic *P. scalaris*, Goldfuss, that it is with some hesitation we have regarded it as new.

2d. *Avicula (Monotis) tenuicostata*, n. s. p., ranging from the lower part of the bed A to near the base of bed C, is very closely related to *M. substriata* of Münster, from the Lias.

3d. *Arca (Cucullæa) inornata*, n. s. p., from the lower part of bed A, is very similar to *C. Munsteri (Zeiten)*, also from the Lias.

4th. *Panopæa (Myacites) subelliptica*, n. s. p., from the bed C, is similar to the Liassic forms *M. Liassensis* and *M. Alduininus* of Quenstedt.

5th. *Ammonites cordiformis*, n. s. p., from bed A, is of the same type as the Oolitic species *A. cordatus* (Sowerby).

6th. *Belmnites densus*, n. s. p., from bed A, is scarcely distinguishable from the Oolitic species *B. eccentricus*, Blinville, if indeed it is really distinct.

In addition to the above, there are in the collection from the beds A, B, and C, other species we have not yet had time to describe, which closely resemble Liassic and Oolitic forms. These facts when viewed in connection with the stratigraphical position of these deposits, below what appear to be lower Cretaceous formations, and as above stated, so far as we yet know, the absence in them of well-marked Cretaceous types, are, we think, sufficient reasons for supposing they probably represent the Jurassic system.*

* On a former occasion we expressed the opinion that Mr. Marcou was mistaken in regard to the existence of Jurassic rocks in the region of the Black Hills. This opinion was based upon the fact that one of us had traversed the belt of country he intended to color, east of these hills, as Jurassic, and found it occupied by Tertiary and Cretaceous formations. We also knew his map of this region had been mainly colored theoretically.

It is, perhaps, scarcely necessary for us to remark that the presence of *Ammonites* and *Belemnites*, in the rocks above alluded to, aside from the other organic remains, is alone satisfactory evidence that they do not belong to the Triassic epoch. It is true the bed C is not known to contain either *Belemnites* or *Ammonites*, but so many of the same forms associated with these fossils in the beds above, range down into the bed C, that unless it be the lowest stratum of yellowish gray sandstone at its base, there appears to be little reason for suspecting that it may belong to another system of rocks. In regard to this lowest stratum of formation C, we would state that the fossils contained in it are casts in a bad state of preservation, but as near as we have been able to determine, some of them appear to belong to types occurring in the beds above; we, therefore, for the present, place it provisionally as a part of the group composing formation C; but it is possible future investigations may bring to light facts that may prove it to belong to an older series, though it evidently is not Carboniferous, nor Permian.

Carboniferous Rocks of the Black Hills.

As may be seen by consulting the foregoing general section of the formations seen in and around the Black Hills, the rocks we regard as of Jurassic age, repose in that region upon a group of deposits, the larger portion, at least, of which clearly belong to the Carboniferous epoch.

We would, however, just here remark before entering upon the discussion of the Carboniferous formations of the Black Hills, that near the south-eastern base of these hills some loose masses of a cherty rock were seen, on more than one occasion, under circumstances indicating that the stratum from which they were derived holds a position between the base of the bed C and the bed D of the section. Yet as these cherty masses were no where actually seen in place, we have not given them a position in the Black Hills' section, though there can scarcely be a doubt that they belong to it. The fossils they contain, or at any rate several of them, are identical with species occurring in a formation in north-eastern Kansas, now known to be of Permian age.

The first formation in the descending order of the foregoing section we are inclined to place, (at least provisionally) in the Carboniferous system, is the bed D, which is composed of a brick-red fine silicious or argillaceous, slightly gritty material, effervescing very feebly in acids. Although from a hundred to one hundred and fifty feet in thickness, no vestiges of any kind of organic remains were seen in any part of this bed; but it was always found to be characterized by large quantities of gypsum, in the form of seams, layers, and large beds or irregular masses.

Beneath the foregoing bed we have a bluish and reddish gray, somewhat gritty limestone (E of the section), varying from 10 to 50 feet in thickness, and containing fossils, resembling coal measure forms. The collections from this rock consist of a small smooth *spirifer*, broader and more compressed than *S. lineatus*, but otherwise somewhat similar, two or three species of *Macrocheilus*, two small species of *Pleurotomaria*, and one or two species of *Bellerophon*, all in a rather bad state of preservation, but showing very satisfactorily their generic characters.

and was necessarily based upon very erroneoua views in regard to its topography. In addition to this, we had found the immense area represented by him as New Red Sandstone, in the upper Missouri country, almost entirely made up of Tertiary and Cretaceous deposits; while not a single Jurassic or Triassic fossil had ever been found throughout the whole country.

Since the position of the Black Hills has been determined by Lieut. Warren, we now know the area occupied by the Jurassic belt Mr. Marcou intended to place east of these hills, actually lies rather on the west of their middle portion, and does probably cover some surface occupied by the formations we regarded as Jurassic.

By these remarks we do not wish to be understood as intimating that a geologist is responsible for errors into which he may be led by incorrect topographical maps; nor do we wish to withhold from Mr. Marcou the credit justly due him for having first suggested the existence of Jurassic rocks in this region.

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Next in the descending order, we have formation F, which is two hundred and fifty to three hundred feet in thickness, and very similar, towards the upper part, to the red bed D in its composition, excepting that it contains less gypsum; below, it passes into a very hard compact gray sandstone, the whole apparently destitute of fossils.

It will, perhaps, be remembered we mentioned in one of our former papers the existence of some facts which we thought point to the conclusion that the great gypsum deposits of the south-west, might be on a parallel with No. 1, or the lower part of No. 2 of our Nebraska section. From the great similarity of these red formations near the Black Hills, to the red gypsum bearing deposits described by Mr. Marcou and others, in Texas, Arkansas, and New Mexico, we are now inclined to the opinion that they all hold the same position, and are of course much older than our No. 1.

The entire absence, so far as we yet know, of organic remains in these red formations in the region of the Black Hills, as well as in the south-west, shows that during their deposition the physical conditions in the waters where they were deposited, must have been unfavorable to the existence of animal life.

That the lower bed F, of the foregoing section, is of Carboniferous age, is very probable, coming in as it does immediately above a well-marked Carboniferous formation, and below a limestone containing fossils closely similar to well-known coal measure forms, two of which belong to genera (*Bellerophon* and *Macrocheilus*), not known, we believe, to range above the Carboniferous system.

It is not, however, so easy to determine the age of the upper red bed D. From its stratigraphical position, as well as lithological characters, it might with almost as much propriety be referred to the Permian or Triassic systems, as to the Carboniferous. Yet as it appears to have been deposited during a repetition of the same physical conditions that prevailed during the deposition of the bed F, we think it is perhaps safer to refer it provisionally, in the absence of palæontological evidence, to the Carboniferous system, though it is possible both these red beds and the intervening limestone may prove to be Permian.

Immediately below the foregoing formations there is a rather fine grained somewhat gritty whitish subcrystalline limestone (G of the section), containing in great numbers a species of *Spirifer*, perhaps new, and resembling more nearly forms common in the lower Carboniferous series of the west than those of the coal measures; along with this a fragment of another *Spirifer* was found, having fasciculate bifurcating costæ, like *S. Meusebachanus* (Roemer), a common coal measure fossil; also two species of *Productus*, one of which is probably identical with *P. semireticulatus*, and an other similar, but smaller species, with apparently a less deeply marked sinus in the larger valve, and a shorter hinge. This bed passes gradually down into a yellowish gritty somewhat friable limestone, in which was found a *Spirifer* having a high area like *S. cuspidatus*; and a large *Euomphalus*, apparently identical with a species common in the Encrinital or Burlington limestone of the lower Carboniferous series in the west,—the two rocks are fifty feet in thickness.

The succeeding formation is a hard yellowish gritty limestone often tinged with red (H of section), in which were found specimens of a small smooth *Terebratula*, a small deeply sinuate *Productus*, and a *Syringopora?* having small, straight, very regularly disposed tubes, about .06 inch in diameter, and separated by spaces about .09 inch across. In the middle of this formation, which is usually forty feet in thickness, there is often seen an 8 foot layer of bluish rather compact argillaceous limestone, containing a smooth *Terebratula* resembling *T. subtileta* (Hall), but perhaps distinct, and a *Productus* like *P. cora*, in the fineness of its striæ.

The fossils in the collection from these lower limestones (G and H) are unfortunately almost all in a very bad state of preservation; so that it is nearly impossible to determine with any degree of certainty their specific characters. As near as can be ascertained, however, the majority of them appear to resemble

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more nearly lower than upper Carboniferous forms, though some of them certainly are like coal measure species.

The color, texture, and composition of the beds are such as to carry the mind at once to the lower Carboniferous series, and quite unlike those of any rock known in the western coal measures.

LOWER SILURIAN.

Potsdam Sandstone.

At several places in the Black Hills, the oldest Carboniferous bed of that region (H) was seen reposing, to all appearances conformably, upon a bed thirty to fifty feet in thickness of reddish and grayish sandstone, composed of angular grains of quartz, cemented by silicious, and sometimes small portions of calcareous matter. The fossils obtained from this rock were *Lingula antiqua*, (Hall), and great numbers of a small shell very similar to *L. prima* (Conrad), but from its thickness and structure probably an *Obolus*; also a shell nearly related to *O. appolinus*, as figured by Murchison and De Vernueil, in their work on the geology of Russia, but perhaps new, and fragments of a Trilobite belonging apparently to one of the forms figured by Dr. Owen from the lower sandstones of Minnesota.

The above mentioned fossils, as will be at once understood by the Palæontologist, clearly prove this lower sandstone (I) to belong to the oldest portion of the Silurian system, or in other words, to the Potsdam sandstone of the New York series. The identification of this rock, at this remote point in the far west, we regard as a matter of peculiar interest, proving, as it does, the extension of that formation several hundred miles further westward than it has hitherto been known to occur in this country.*

METAMORPHIC AND IGNEOUS ROCKS.

At almost every place where the base of the Potsdam sandstone was seen in the Black Hills, it was found to repose upon what appears to be upturned edges of an ancient series of sedimentary rocks. These older rocks present the appearance of having their strata thrown into a vertical or highly inclined condition, while the Potsdam, although much disturbed, rests unconformably upon them.

Further in towards the interior of the mountain, and beneath the metamorphic rocks, as already stated, the main body of the Black Hills is composed chiefly of a coarse feldspathic granite and other igneous rocks.

DESCRIPTIONS OF NEW FOSSILS.*

PENTACRINUS ASTERISCUS.

Our knowledge of this crinoid is entirely derived from detached pieces of its column, and other parts, as seen imbedded in a sandy matrix cemented by calcareous matter. These segments or joints of the column may be characterized as rather thin, small, and very symmetrical pentagonal, star-shaped bodies, the rays of which are usually longer than wide, and rather acutely angular at their extremities. Through the centre of each joint there is a very small circular perforation, from which five regular lance-oval, petaloid areas radiate, one to the extremity of each of the angles; the areas being bounded by rather narrow, slightly elevated transversely crenulate margins.

The above description applies more particularly to the largest sized specimens, measuring about .18 inch across from point to point of the opposite angles. Associated with these there are other much smaller joints, varying from .05 to .10 inch in diameter. These have proportionably shorter and broader rays, or

* Figures and more extended descriptions to appear in Lieut. Warren's final report.

angles, which, however, appear never to be rounded at the extremities. It is possible these smaller joints may belong to another species, though we incline to the opinion that they are only the joints of smaller individuals of the species here indicated.

The star-like surfaces of the column joints above described, present some varieties of form, but usually resemble so closely those of *S. scalaris*, Goldf., that we are in some doubt about the propriety of considering our fossil a distinct species. These joints are all much smaller than those figured by Goldfuss, and appear never to have had the angles so short and rounded as some of the examples given by that author and Quenstedt, of *P. scalaris*.

Locality and position.—South and south-west base Black Hills; Stone Butte. Lower part of bed C of the accompanying section.

LINGULA BREVIROSTRIS.

Shell oblong elliptical, thin; lateral margins slightly convex, nearly parallel, sometimes converging a little towards the beaks in young individuals; front subtruncate; cardinal edge sloping to the beaks at an angle of about one hundred and thirty degrees; beaks obtuse, scarcely projecting beyond the cardinal margin; valves nearly equal, convex along the middle, compressed near the margins and in front. Surface polished, and marked by fine rather obscure concentric striæ; on the surfaces of the inner laminæ a few very obscure radiating, or longitudinal lines are sometimes seen along the middle of the valves, near the front. Length .54 inch; breadth .35 inch; thickness (depth of the two valves) .16 inch.

Locality and position.—Western and south-western base Black Hills, towards lower part of bed C of foregoing section.

INOCERAMUS UMBONATUS.

We only know this species from an internal cast of a left valve, with portions of the shell adhering near the beak and hinge. This valve is remarkably gibbous, and the beak, which is a little oblique and near the anterior side, is much produced, elevated and involuted, so as to give the valve the appearance of some of the Palæozoic univalves usually referred to the genus *Capulus*. The aperture of this valve is subcircular, being straighter on the hinge side than elsewhere. The portion of the shell remaining near the hinge is very thick, and composed of an inner laminated layer, and an external coarsely fibrous portion, the latter being much thicker than the other. We know nothing of the surface markings, beyond the fact that obscure concentric undulations are visible on the cast.

The remarkable form of this valve indicates that the other must have been comparatively much less gibbous, or, perhaps, bore the relations to this, of an operculum to a univalve shell, as in *I. involutus* of Sowerby. It is the first species of this type discovered in American formations, so far as we know. Height 3.10 inches; length 2.38 inches.

Locality and position.—This specimen was obtained from near Fort Benton on the upper Missouri; but as it was found by a person unacquainted with geology, at a locality not yet visited by any person familiar with the formations of the country, its position is doubtful. The composition of the matrix, however, as well as the thickness and structure of the shell, lead us to think it holds a position in No. 4 of the general section; all the north-western species yet known from formations below No. 3 being comparatively thin and entirely fibrous.

AVICULA (MONOTIS) TENUICOSTATA.

Shell suborbicular, or slightly oval, a little oblique, usually higher than long; valves nearly equally convex; anterior side subtruncate, rounding rather abruptly into the hinge above, forming a broad oblique curve below; basal and postero-basal margins rounded; upper posterior margin sloping obliquely for-

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ward, but often curving gently outwards just below its junction with the extremity of the hinge line, so as to make the angle of the small, more or less compressed posterior wing not more than eighty or ninety degrees; hinge line less than the greatest length of the shell. Beaks scarcely oblique, located nearer the anterior than the posterior side; that of the left or larger valve more prominent than the other, and extending a little above the hinge; beak of the smaller valve more compressed, and scarcely distinct from the hinge margin. Surface marked by small, obscure, slightly elevated, radiating lines or costæ, which are less than the spaces between, and crossed by fine, nearly obsolete lines of growth, usually most distinct near the upper anterior margin. Length .60 inch; height .64 inch; breadth .26 inch.

The sinus for the passage of the pedal muscle in the anterior margin of the smaller valve is rather deep, narrow, and connected with a deeply impressed narrow groove, which extends on the outside of the valve nearly parallel to the hinge, quite to the beak.

The surface markings are usually rather obscure on both valves, and often nearly obsolete on the smaller one. Young individuals are more nearly orbicular than mature specimens.

A closely allied representative of the Liassic species *Monotis substriata* Müntz. (see Leonh. Br. t. ii, p. 8, 406.)

Locality and position.—Southwestern and eastern sides of Black Hills, ranges from upper part bed A, low down in bed C, but not in to B.

MYTILUS PERTENUIS.

Shell small, extremely thin and fragile, slightly arcuate; valves convex along the middle from near the beaks, obliquely backwards and downwards to the lower part of the posterior end; extremities narrowly rounded, the anal end being a little broader than the other, and having its most prominent part below the middle. Base somewhat arched behind the middle, more prominent and curving very gradually upwards toward the front; dorsum carinate from a little behind the beaks posteriorly, its outline forming a broad, sloping curve. Hinge nearly straight, rather short, rounding gradually into the dorsal edge behind. Beaks small, rather obtuse, subangular above, and located at the anterior end, scarcely projecting beyond the hinge and anterior margin. Surface marked by fine, rather obscure lines of growth.

Locality and position.—West base of Black Hills, bed C, of the accompanying section.

ARCA (CUCULLÆA) INORNATA.

Shell oblong-oval, subrhombic, rather gibbous in the umbonial region; anterior side rounded up from below, so as to meet the hinge at an angle of about ninety degrees; posterior side a little broader than the other, obliquely truncate above, somewhat narrowly rounded below; base nearly straight along the middle, but not exactly parallel to the hinge, rounding up more gradually towards the front than behind. Beaks rising somewhat above the hinge, rather pointed, incurved and very slightly oblique, located a little in advance of the middle; posterior umbonial slopes subangular. Hinge rather long, but not equalling the greatest length of the shell; posterior teeth two or three in each valve, linear and elongate parallel to the hinge margin; anterior teeth much shorter and oblique; ligament area not very broad. Surface apparently smooth. Length .75 inch; height .45; breadth .46 inch.

Has the teeth of the hinge arranged like those of *Cucullæa*, or approaching those of *Macrodon*, but the posterior muscular impression seems not to be raised upon a projecting lamina as in those genera.

Locality and position.—South western base of Black Hills; also around Bear Butte, on east side of Black Hills, bed A, of the foregoing section.

UNIO NUCALIS.

Shell oval, moderately gibbous; extremities rather narrowly rounded, the most projecting part of the posterior end being below the middle, and that of the anterior extremity above it; base semioval, often quite prominent in the middle; beaks a little depressed, located about half way between the centre and the anterior end; umbonial region rather gibbous, and rising above the hinge, subangular on the posterior slopes. Surface marked by fine lines of growth, and more or less distinct concentric wrinkles; the latter becoming quite small and very regular on the beaks. Traces of extremely small regular radiating wrinkles are also sometimes seen between the obscure angle on the back part of the umbones, and the hinge. Length 1.85 inches; height 1.34 inches; breadth 1 inch.

We were at first in much doubt about referring this shell to the genus *Unio*, because it is associated with a small oyster and *Ammonites Henryi* of this paper. The hinge, however, as far as we have been able to make out its characters, is like that of the genus *Unio*, and entirely different from *Cardinia*, and other forms usually resembling *Unio*. In the left valve, (we have not seen the hinge of the right valve,) it is moderately thick, somewhat arched, and provided with two posterior lateral teeth, which are elongated parallel to the cardinal edge, and separated by a groove apparently for the reception of a tooth in the other valve. The cardinal tooth, which is placed nearly under the beak, is rather irregular, somewhat flattened, and a little corrugated on the edge.

In addition to the foregoing characters, we are led to think this must be a true *Unio*, from finding in the same matrix several specimens of a small *Planorbis* and a fragment of *Paludina*.

Locality and position.—Southwest base of Black Hills, in lower part of No. 1.

CORBULA INORNATA.

Shell small, trigonal, very gibbous; anterior side more or less rounded; posterior extremity angular below, base semioval, the most prominent part being towards the front; hinge sloping from the beaks, which are central; posterior umbonial slopes angular. Right valve more convex than the other, and having its beak more gibbous, elevated and incurved; but the margins of the two valves are equal, nearly or quite closed, and a little warped. Surface nearly smooth or only marked by very obscure lines of growth, and sometimes a few indistinct concentric wrinkles near the base. Length .27 inch; breadth .29; height of larger valve .23 inch, of smaller .20 inch.

We have not yet had an opportunity to see the interior of this shell, but owing to the fact that there is often seen on the posterior side of each valve, just within the posterior umbonial angle, a rather distinct groove curving down from the beaks, directly over the position of the raised internal lamina in our genus *Corbulamella*, we suspect this species may possibly be found to possess the internal characters of that genus.

Locality and position.—Long Lake, No. 5, of the general section.

PANOPÆA (MYACITES) SUBELLIPTICA.

Shell narrow, subelliptical, or subovate, moderately compressed, extremities narrowly rounded, the posterior end being more compressed than the other, and sometimes very faintly truncate on the oblique upper slope, both ends apparently nearly closed, or but slightly gaping. Base forming a very broad gentle curve, rounding up gradually towards the extremities; dorsal outline slightly concave in front and rear of the beaks, the anterior slope being more abrupt than the other. Umbonial region obscurely angular on the posterior side; beaks rather depressed, but rising above the hinge, approximate, and located in advance of the middle. Surface of cast marked by small, moderately distinct, irregular concentric wrinkles of growth. Muscular and pallial im-

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pressions unknown. Length 2.10 inches; height 1.10 inches; transverse breadth .70 inch.

Locality and position.—Western and southwestern base Black Hills, low down in bed C of the accompanying section.

TEREDO GLOBOSA.

Shell globose, thin, rounded or subtruncate and gaping posteriorly; anterior hiatus large, and consisting of a rectangular notch extending from the base half way up towards the beaks, and back to the middle of the shell. Umbonial region gibbous; beaks placed near the anterior side, much incurved obliquely forward. Surface marked by rather distinct lines of growth, which, on the back part of the shell, curve down, parallel to the posterior border, until they approach a small indistinct ridge, or slightly elevated line, passing down from the umbones, when they curve abruptly upwards nearly parallel to the margin of the anterior hiatus, becoming at the same time much finer and more regular, as well as very finely and beautifully crenulate; on reaching a small, indistinct groove, which curves down obliquely from the beaks towards the corner of the anterior notch, these lines are abruptly deflected upon the anterior portion of the shell extending out over the notch.

The tubes are thin, subcylindrical, and sometimes nearly straight, but generally variously curved; and increase gradually from the smaller to the larger end. Length of shell .23 inch; height and breadth of do. each .22 inch. Diameter of one of the larger tubes .26 inch.

Locality and position.—Square Butte, near Fort Clark, upper part of No. 5 of the general section. Found in great numbers in large masses of fossil wood.

PHOLAS CUNEATA.

Shell small, very thin, cuneiform, most gibbous at the anterior end, which is truncate, and more or less gaping,—narrowing and much compressed posteriorly; anal extremity very narrowly rounded and gaping a little. Dorsal margin declining slightly from behind the beaks, with a very gentle convex curve towards the posterior end; basal margin nearly straight, or a little concave in outline. Beaks small, located at the anterior extremity, scarcely rising above the hinge, incurved and touching.

The surface is marked by small concentric wrinkles, which are much more distinct on the gibbous anterior half of the shell than behind, and crossed by two grooves, the anterior one of which is linear, but well defined (on the cast), and extends from the beaks downwards, and a little backwards, so as to reach the base in advance of the middle; the other groove is more shallow, broader, less distinctly defined, and extends from the back part of the beaks, obliquely backwards and downwards, just within the subangular posterior umbonial slopes.

There is also a small ridge or elevated line, on the anterior end of each valve, curving parallel to the concentric wrinkles, from the base about half way up towards the beaks, from which point it is deflected abruptly at right angles forward, so as to delineate exactly the form of the angular notch or hiatus of *Teredo* and *Xyophaga*; but the margin of the valve, (at any rate in adult shells) extends out beyond this line, so as to leave a comparatively small hiatus.

The posterior muscular impression is long, very narrow, and placed near the postero-dorsal edge; while the pallial line passes obliquely down near the middle of the valves, and appears to be provided with two sinuses, the upper one being very small, and lower of medium size. The space behind the pallial line is marked on the interior by extremely fine, obscure radiating striæ. Length .37 inch; height .18 inch; breadth .16 inch.

Locality and position.—Long Lake, No. 5 general section.

ACTEON (SOLIDULA) ATTENNUTA.

Shell small, elongate; spire elevated; volutions (number unknown) depressed, or but slightly convex, separated by a shallow, but distinct suture. Surface ornamented by numerous small punctate striæ, usually less than the spaces between, and numbering about fourteen on the second turn; sometimes there is on the body whorl a much smaller stria between each two of the others; while near the base of this volution the striæ are stronger than above, and more distinctly punctate. Lip and columella unknown. Length about $\frac{5}{7}$ inch; breadth $\frac{1}{7}$ inch; apical angle convex, divergence 18° .

As our specimen is not in a condition to show the collumella, we are left in some doubt respecting its generic relations, but its form and surface markings are similar to those of species usually referred to the genus *Acteon*.

Locality and position.—Yellow-stone river, formation No. 4 and 5 blended together.

HELICOCERAS? TORTUS.

Our specimen of this species is a fragment, consisting of one septate volution of the spire. This evidently belonged to a sinistral conical shell, composed (at any rate during a part of its growth) of rounded whorls, which are coiled in an ascending spiral, so far out of the same plane as to be disconnected by a free space equalling about one-third the diameter of each succeeding whorl below. The umbilical cavity left within, is, at its aperture, less than the diameter of the largest volution; while the whorls increase in size, so as nearly to double their diameter each turn. The surface is ornamented by two rows of rather low nodes, passing round the lower outer side (the apex of the spire being above) of the whorls,—and small, but distinct annular costæ, which often bifurcate at the nodes.

The siphuncle is very small, and in the specimen before us presents the remarkable peculiarity of gradually changing its position in passing from the smaller to the larger extremity of the fragment before us. That is to say,—at the smaller end of the specimen, it occupies exactly the middle of the dorsal, or outer side, but in passing round it gradually curves upwards, so that by the time it reaches the larger end, it comes out on the summit of the whorl. Consequently, if it goes on in this way, another turn of the spire would bring it on the inner or umbilical side,—a third on the underside, and the fourth again on the dorsal or outer side. It is also worthy of note that the lobes and saddles of the septa, and to some extent the nodes, followed the peculiar curve of the siphuncle, so that it would seem the whorls not only form an ascending spiral curve, but are, as it were, at the same time, twisted in such a manner as to change the relative positions of the dorsal and ventral sides.

The septa are provided with six lobes and six saddles, the larger of which are profoundly sinuous and variously branched. The dorsal lobe is comparatively small, and ornamented at the extremity by two nearly equal branches, each of which is subdivided into from three to five small divisions with sinuous margins; above this there is a small lateral branchlet on each side, the right hand one of which is bifid. The superior lateral lobe is considerably larger than the dorsal lobe, and deeply divided by its auxiliary saddle into two large unequal spreading branches, of which the one on the ventral side is somewhat longer than the other, and provided at the extremity by two nearly equal spreading bifid branchlets and several smaller digitations; the other principal division is less deeply divided at the extremity into two unequal parts, the terminal or longer of which is bifid: the margins of the main branches, as well as of the body of the lobe, are also provided with several subordinate divisions with sinuous edges. The inferior lateral lobe is somewhat smaller, but in other respects scarcely differs from the superior lateral lobe.

The dorsal saddle is nearly as large as the inferior lateral lobe, but less spreading above, and narrower, as well as more oblique at its base; while its extremity is profoundly divided, by its auxiliary lobe, into two subequal tripartite,

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deeply sinuous branches. The lateral saddle is very nearly of the same size and form as the dorsal lobe, but less oblique, and a little more deeply divided by its long auxiliary lobe.

The greater transverse diameter of our specimen is 2.43 inches; do. of umbilicus, .65 inch; diameter of larger end of the whorl 1.04 inch; do. of the smaller end .74 inch; diameter of the siphuncle at the larger extremity .6 inch.

The peculiar twisted character of the volutions in this shell led us to suspect it may be found, when better specimens are obtained, to constitute a distinct genus from any Cephalopod hitherto described. For the present, however, we refer it provisionally to the genus to which it appears most nearly related.

Locality and position.—Great Bend of the Missouri, lower part of No. 4, general section.

TURRILITES (HELICOCERAS) COCHLEATUS.

Shell sinistral, very thin, and composed of rounded, nearly or quite contiguous whorls, which gradually increase in size from the smaller to the larger extremity; umbilicus slightly wider than the diameter of the largest whorl. Surface ornamented by numerous small rather irregular bifurcating, annular costæ, which first pass obliquely backwards and outwards from the umbilicus above, then curve so as to cross the dorsum obliquely downwards and forwards, but on reaching the lower side, they curve backwards again, in approaching the ventral side. There are also two rows of obscure, flattened, or depressed oval nodes, one of which passes round nearly exactly over the siphuncle, which occupies the middle of the outer side of the whorl, while the other is placed less than one-fifth of the circumference of the whorl lower down.

The septa are rather distant, and divided into six lobes and six saddles, which are a little unsymmetrical, in their subordinate details, but about of the same size and general form on opposite sides of the siphuncle. The dorsal lobe is small, and ornamented at the extremity, by four small branches, the two terminal of which are a little larger than the others, slightly dissimilar, and each provided with five or six unequal digitations; the other two divisions are not exactly opposite, differ slightly in form, and are each armed with about from three to five or six unequal digitate points: above these principal terminal divisions, there are also along the body of the lobe a few small alternating lateral pinnules.

The superior lateral lobe is greatly larger than the dorsal lobe, and very deeply divided into two great, subequal, spreading branches, of which the one on the ventral side is a little larger than the other (especially on the side of the whorl below the siphuncle), and unequally subdivided into three bifid branchlets, the two terminal of which are much larger than the third, and each ornamented by several small unequal, projecting points, the other main branch is divided into two principal, bifid branchlets with many smaller sinuosities and digitations. The inferior lateral lobe is somewhat smaller than the superior, but in other respects very similar.

The dorsal saddle is small, very oblique, much contracted at its base, and divided above into two unequal variously subdivided, sinuous branches. The lateral saddle is not so oblique, but does not otherwise differ materially from the dorsal saddle.

Our specimen consists of a little more than half a volution, the greatest transverse diameter of which is 2.34 inches; breadth of umbilicus .75 inch. Diameter of the volution at larger end, which is a little oval, .73 inch by .64 inch; do. of smaller end, which is very nearly circular, .54 inch.

It is not easy to determine, from our specimen, whether this species is most nearly related to the genus *Turrilites* or *Helicoceras*. In the rounded and comparative slender form of its whorls, as well as the large size of its umbilicus, it is more like the latter genus; while the fact that the volutions are nearly or quite in contact, as is shown by an impression left on the matrix, would seem to indicate that it must belong to the genus *Turrilites*. It is probable, however,

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these two types will be found to be connected by many intermediate gradations of form, when larger numbers of these *Cephalopods* are known.

Locality and position.—Great Bend of the Missouri, lower part of No. 4.

HELICOCERAS TENUICOSTATUS.

The fragment upon which we propose to found this species is slender, nearly cylindrical, and increases very gradually in size, from the smaller to the larger extremity. It makes a remarkably broad sinistral, ascending spiral curve, so as to leave the volutions disconnected, and form a large umbilical space, having a diameter about four times as broad as that of the largest whorl. The siphuncle is of medium size, and occupies a position above the middle of the outer side of the volutions.

The surface is ornamented by rather irregular moderately distinct annular costæ, which occasionally bifurcate, and pass nearly straight around the whorls. On the outside of the volutions the costæ are stronger than within, and show a disposition to swell out into obscure nodes. Length of fragment 1.64 inch; diameter at larger extremity .49 inch; do. of smaller end .44 inch.

We have for a long time past had this specimen in our possession, but always supposed it identical with *Hamites Mortoni*, (Hall and Meek, Mem. Am. Acad. Arts and Sci. N. S. vol. 5, pl. iv. fig. 3 a. c.) which is probably a *Helicoceras*. After a more careful comparison, however, we find the following differences, which we think are of specific importance,—in the first place, the costæ of the shell now before us are less prominent, and encircle the volutions much less obliquely than those of *H. Mortoni*; while the siphuncle occupies a higher position in the dorsum, and the spiral coil of the shell was sinistral, while that of *H. Mortoni* is dextral. In addition to the foregoing, there are well marked differences in the details of the lobes and saddles of the septa, which cannot, however, be well explained without the use of figures.

Locality and position.—Great Bend of the Missouri, lower part, No. 4.

TURRILITES? UMBILICATUS.

We have of this species nearly an entire volution, a little more than half of which is septate, but not in a condition to show the form of the lobes. It is a sinistral shell, the rounded volutions of which are coiled in an ascending spiral, nearly or quite in contact, and increase gradually in size, from the smaller to the larger extremity. The umbilicus is a little less than the diameter of the largest volution; and the siphuncle occupies a position in the middle of the outer side of the whorls.

The surface is ornamented by rather distinct, annular bifurcating costæ, which, on the upper side of the whorls, curve first obliquely backwards and outwards from the umbilicus, then forwards and downwards, as they cross the dorsum, and on reaching the under side, curve inwards to the umbilicus. There are also two rows of more or less distinct nodes passing around the under outer side of the whorls, at which the costæ usually bifurcate.

Greatest transverse diameter across the volutions and umbilicus 3.20 inch; breadth of larger end of whorl 1.19 inch; do. of smaller end 1.06 inch.

Not having seen the septa of this species, it is with some hesitation we have considered it distinct from *T. cochleatus* of this paper; though it differs from our specimen of that species in having less neatly rounded volutions, much stronger nodes and costæ, and proportionably a little smaller umbilicus; they may, however, be only varieties of the same species.

Locality and position.—Great Bend of the Missouri, lower part of No. 4 of general section.

ANCYLOCERAS (HAMITES) UNCUS.

We have only seen a fragment of this specie, consisting of the curved portion of the non-septate, or body part of the shell. It is compressed laterally, and makes a rather short curve in the same plane,—leaving between the two extre-

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mities, a free space equalling about half the greater diameter of the larger limb; both ends are then extended in the same direction, and, apparently, nearly parallel.

The surface is ornamented by strong, rather angular more or less oblique annular costæ, which occasionally bifurcate on the sides, and are much more prominent towards the dorsal, than the ventral side. There are, also, two rows of rather small nodes on each side of the dorsum, placed on the costæ; those nearest the dorsum being more prominent than the others, which merely consist of a slight swelling of the ribs.

Diameter across the curve 3.92 inches; greater diameter, transverse section of larger limb 1.73 inch; smaller diameter of do. 1.10 inch.

We are unable to determine from this fragment whether it is an *Ancyloceras* or a *Hamite*.

Locality and position.—South fork of Cheyenne River, near base of Black Hills. No. 4, of the general section.

AMMONITES CORDIFORMIS.

Shell, when young, rather compressed, but becoming much more convex with age; dorsum distinctly carinate, in small specimens, much more obtuse in the adult. Umbilicus one half to one third as broad as the outer whorl; proportionally smaller in large than small individuals; transverse section of the volutions distinctly cordate. Surface ornamented by numerous small costæ, which are largest near the umbilicus, where they sometimes (in the medium sized specimens) swell a little, so as to form obscure transversely elongated, subnodose prominences. A short distance beyond this, they bifurcate regularly, or are increased by the implantation of others between, to two or three times their number, at the umbilicus. As they approach the dorsum, they curve distinctly forward, and in passing over it, impart to the dorsal carina, especially in young specimens, a more or less distinctly serrated outline: on the outer volutions of large individuals, the costæ are almost entirely obsolete,

The septa, which are not very closely crowded, are divided into five lobes on each side, the first four of which are similar in their mode of branching to those of *A. cordatus* of Sowerby; but they are less deeply sinuous, and present other differences in their details. Greater diameter (of an imperfect specimen) 3.30 inches; transverse diameter of its outer whorl 1.90 inch; breadth of same from umbilicus to dorsum 1.64 inch. Breadth from umbilicus to dorsum of a portion of an outer volution of large individual 3.50 inches; transverse diameter of same, near the umbilicus 3.18 inches.

In many respect this shell is nearly related to the Liassic species *A. cordatus*, of Sowerby, of which it may be regarded as a representative. All our specimens are internal casts.

Locality and position. South west base of Black Hills, associated with the foregoing species.

AMMONITES HENRYI.

Shell convex lenticular; dorsum narrowly rounded, or subangular; inner volutions entirely hidden: umbilicus very small and deep: surface apparently without nodes or costæ.

Septa not very profoundly lobed, rather closely crowded, slightly unsymmetrical on opposite sides of the shell. Dorsal lobe divided into four principal branches, the two terminal of which are smaller than the others, and usually tridigitate at their extremities; while the two lateral divisions are bipartite, with more or less sharply dentate extremities.

The superior lateral lobe is about the size of the dorsal lobe, and irregularly divided into four nearly equal branches, one of which, on the dorsal side, is separated from the others by a deeper and broader sinus, than those by which they are divided; while the other three branches form together a kind of large tripartite division: each of the four branches is provided at the extremity with

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from three to six sharp digitations. The next succeeding lobe is not more than one-fourth as large as the superior lateral lobe; it is, on one side of the shell, divided nearly to its base, into two equal branches; while the corresponding lobe on the other side, is narrower, and rather regularly divided into three short sharply digitate branches. The remaining lobes are very small, and simply digitate at their extremities. Greatest diameter 2.14 inches; transverse diameter 1.33 inches.

This species is remarkably distinct in its internal structure from all the *Ammonites* hitherto found in this country. We take pleasure in naming it in honor of the distinguished philosopher Prof. Joseph Henry, Secretary of the Smithsonian Institution.

Locality and position. Southwest part of Black Hills, lower bed of No. 1, general section of Nebraska formations, and of preceding section.

SCAPHITES LARVÆFORMIS.

Shell small, ovate, laterally compressed, rounded on the dorsum; body whorl cylindrical, first extended horizontally from the convoluted inner whorls, then curving upwards a little, after which it bends backwards upon itself, so as to bring the aperture almost in contact with the inner coil; but leaving a free space within the curve. Inner whorls mostly hidden, forming a small coil at one end of the shell, and so closely rolled up as to leave but a very small umbilical impression: aperture nearly circular. Surface ornamented by rather small costæ which pass round a little obliquely from the inner side of the whorls, to a point about halfway across the outsides, where they swell out into small obscure transversely elongated nodes, and then each branch into two or three smaller costæ, which pass very regularly over the dorsum.

The septa are moderately close, and provided with three lobes on each side, of which the superior lateral is the largest. The dorsal lobe is still larger, and provided with two small obscurely bilobate branches on each side. Greatest length .88 inch.; greatest height .60 inch.; breadth of the body whorl .32 inch.

This species is very closely allied in the structure of its septa to *S. hippocrepis*, DeKay, (*S. Cuvieri*, Morton, Synop. Org. Remains, pl. vii. fig. 1,) but differs in the details of its septa lobes, and the body whorl is proportionally much more slender, more cylindrical, and forms a larger curve; it also wants the outer row of round nodes.

Locality and position.—East base of the Black Hills, formation No. 2 of the general section.

BELEMNITES DENSUS.

Shell large and thick, subcylindrical, more or less compressed laterally, so as to give the cross section a slightly oval outline: lower portion tapering to a point, sometimes a little oblique, usually more compressed than any part above, often having a narrow obscure groove on the ventral side, and sometimes a very slight carina on the dorsal side, near the apex; the groove being more frequently present than the carina, and extending further up from the point: surface smooth.

Alveolus extending about half way down from the summit to the lower extremity, where it terminates nearly midway between the centre and the ventral side; from this point the apical line passes down, gradually approaching the ventral margin, but curving slightly so as not to intersect it before reaching the apex.

Phragmacone conical, very slightly curved, apical angle 20° ; septa rather closely arranged, about twenty of them occurring in a section one inch in length, measuring .72 inch in diameter at the larger end, and .35 inch at the smaller end; siphuncle unknown.

The best specimen we have seen, of the outer horny shell, measures 5 inches in length, and .90 inches in diameter at the larger end; the alveolus measures

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about 2.39 inches in length, and .75 inch across the aperture. Some fragments, in the collection of other individuals, appear to have been at least one third larger than the specimen from which the above measurements were taken.

This species is closely allied to *B. excentricus*, Blv., and *B. panderianus* D'Orbigny, of the lower oolite, but appears to be distinct from both.

Locality and position. Southwest base Black Hills. Also east side of same; near Bear Peak. Bed A of the section.

We are under many obligations to Prof. Henry for the use of rooms and books, and also for other facilities at the Smithsonian Institution, while making the forgoing investigations as well as those of our former papers.

Description of New Species of Coleoptera, chiefly collected by the United States and Mexican Boundary Commission, under Major W. H. Emory, U. S. A.

BY JOHN L. LE CONTE, M. D.

GALERITA Fabr.

G. atripes, nigra, capite punctato postice oblique rotundato, thorace elongato, rugose punctulato rufo, lateribus postice late sinuatis, ad basin utrinque impresso, elytris elongatis oblongo-ovalibus, confertissime rugose punctulatis, æqualiter pubescentibus, striis punctulatis. Long. .67.

One specimen in Dr. Berlandière's Collection, probably found on the Rio Grande: many others have been recently collected by Dr. W. A. Hammond, at Fort Riley, in Kansas. This species has the form, size and sculpture of *G. Lecontei*, and *G. californica*, but differs by the uniform pubescence of the elytra, the less sinuate sides of the thorax, and still more by the black antennae and feet.

CALLEIDA Dej.

C. planulata, nigro-picea, supra cuprascens, thorace latitudine longiore, parum convexo, canaliculato, lateribus rotundatis, ante medium magis angustato, pone medium parum angustato, utrinque ad basin profunde late foveato; elytris interstitiis paulo convexis parce punctulatis, margine virescente ante medium subimpresso, antennis articulis tribus primis ferrugineis. Long. .48.

One specimen from Dr. Berlandière's Collection. The base of the thorax is broadly subsinuate, and only slightly oblique towards the angles, which thus become almost rectangular, although the sides of the thorax are not sinuate.

C. cyanoptera, rufa, capite nigro-cyaneo, thorace latitudine fere sesqui longiore, minus convexo canaliculato, lateribus late rotundatis, pone medium paulo angustato, et lateribus subsinuato, utrinque profunde impresso; elytris læte cyaneis, tenuissime punctulato-striatis; abdomine genibusque nigris, antennis extrorsum nigro-piceis. Long. .32—38.

Also from Dr. Berlandière's Collection. Larger than *C. decora*; the thorax is less convex, more broadly rounded on the sides anteriorly, and less narrowed and sinuate behind the middle. The posterior angles are hardly prominent, and owing to the obliquity of the base are very obtuse.

STENOMORPHUS Dej.

S. rufipes, valde elongatus, niger nitidus, thorace latitudine sesqui longiore, postice sensim angustato, angulis posticis rotundatis, ad basin utrinque breviter et profunde impresso, elytris profunde striatis, antennis palpis pedibusque obscure ferrugineis. Long. .42.

Dr. Berlandière's Collection.

HARPALUS Latr.

H. laesus, ovalis supra æneus, thorace latitudine fere duplo brevior, lateribus rotundatis, magis versus apicem, postice subangustato et utrinque vix impresso, angulis posticis obtusis, fortius marginato, margine diaphano; 1858.]