*Descriptions of new species of Gasteropoda from the Cretaceous formations of Nebraska Territory.**

By F. B. Meek and F. V. Hayden, M. D.

The species indicated in the following paper comprise a portion of an extensive collection recently brought from Nebraska by one of the authors.† It is worthy of note that some of the species contained in the collection from the most recent Cretaceous beds of the upper Missouri country appear referable to genera which, according to high European authority, date no farther back than the true chalk, while many of them are closely analogous to Tertiary forms; so close indeed, that had they not been found associated in the same beds with Ammonites, Scaphites and other genera everywhere regarded as having become extinct at the close of the Cretaceous epoch, we would have considered them Tertiary species. If these beds really are equivalent to any portion of the Green sand of English geologists, it is a curious fact that we should find mingled together in them upper Cretaceous and Tertiary forms exactly as if they and those of the older Tertiary were deposited in the regular order of sequence. Such facts however are sometimes met with amongst Palæozoic formations.

The following section exhibits the order of superposition of the formations in which our Cretaceous fossils were found, and their relations to the Tertiary and older rocks.

Tertiary 400 to 600 ft.		Beds of clay, sandstone, lignite, &c., containing remains of vertebrata, and at places, vast numbers of plants, with land, fresh water, and sometimes marine or estuary mollusca.
Cretaceous system.	5	Gray and yellowish arenaceous clays containing great numbers of marine mollusca with a few land plants. 100 to 150 feet.
	4	Plastic clays with numerous marine mollusca. About 350 feet.
	3	Gray and yellowish calcareous marl, containing Ostrea congesta, fish scales, &c. 100 to 150 feet.
	2	Grayish and lead colored clays having few fossils. 80 feet.
	1	Sandstones and clays not positively known to belong to the Cretaceous system. 90 feet.

Limestones of upper coal measures at Council Bluffs, containing Spirifer Meusebachanus, Allorisma terminalis, Terebratula subtilita, Fusulina cylindrica, &c.

Scalaria cerethiformis. Shell elongate-conical, turreted, not umbilicate; volutions seven or eight, convex, closely contiguous, traversed by numerous sharp, slightly curved costæ, less than the spaces between; surface marked by irregular lines of growth, crossed by fine, unequal, thread-like, revolving lines, as strong on the costæ as between them; suture distinct; aperture ovate, angular on the inner side above, rounded below; lip thin, curved outwards on the inner side below. Length 1.65 inches, breadth .73 inch; length of aperture .52 inch, breadth .40 inch; apical angle slightly convex, divergence about 28°.

Locality. Moreau trading post, No. 5 of the series, rare.

Acteon subellipticus. Shell elongate-oval or narrow elliptical; spire somewhat elevated; volutions about four; surface polished, and ornamented by about twenty-five regular revolving striæ, composed of round punctæ so disposed as to range up and down the shell exactly parallel to the obsolete lines of growth; suture distinct; aperture narrow, curved, acutely angular on the inner side above,

* Figures, comparisons, and remarks to be published hereafter.

† Dr. Hayden.

gradually widening downwards to about the middle, from which point it again very gradually contracts towards the narrowly rounded front; outer lip thin; columella having a single small oblique fold, outside of which there is a small umbilical groove. Length .25 inch, breadth .10 inch; apical angle regular, divergence 57°.

Locality and position. Crow Creek near Black hills. No. 4 of the series.

AVALANA SUBGLOBOSA. Shell globose or subovate; spire very short, slopes rounded; volutions four, increasing rapidly from the apex, last one very large and ventricose; surface ornamented by about thirty punctate striæ, half as wide as the elevations between on the upper part of the volutions, but much more closely crowded on the lower part of the last turn; suture linear, distinct; aperture semilunar, widest below, contracted and terminating in a smoothly rounded angle above; outer lip smooth within, faintly sinuate below and having a thick strong peristome without; inner lip thick and raised into a single prominent tranverse tooth below. Length .39 inch, breadth .37 inch; length of aperture .21 inch, breadth .11 inch.

Locality and position. Moreau trading post. No. 5 of the series.

NATICA ? AMBIGUA. Shell obliquely suboval, or oblong; spire depressed-conical; volutions about four, convex, increasing somewhat rapidly from the apex, last one ventricose; surface marked by fine lines of growth and stronger parallel wrinkles, crossed by strong irregular revolving striæ; suture distinctly impressed, aperture obliquely ovate, angular above, rounded below; lips thin, apparently disunited above and abruptly deflected outward on the inner side below the small or rudimentary umbilicus. Length .50 inch, breadth .42 inch; length of aperture .34 inch, breadth of do. .24 inch; apical angle convex, divergence 81°.

Locality and position. Same as last.

NATICA OCCIDENTALIS. Shell obliquely-oval or ovate; spire elevated; volutions about five, convex; surface marked with fine lines of growth, and faint or nearly obsolete, minutely flexuous revolving lines; suture distinctly impressed; aperture ovate, straight on the inside and broadly rounded without; outer lip thin; inner lip not thickened, partly deflected over the edge of the small oblique umbilicus. Length about .97 inch, breadth .70 inch; length of aperture .56 inch, breadth .33 inch; apical angle convex, divergence 70°.

Locality and position. Same as preceding.

NATICA MOREAUENSIS. Shell obliquely-ovate; spire somewhat depressed; volutions three and a half to four, convex, last one large and ventricose; surface marked by fine lines of growth, crossed by very fine, nearly obsolete, minutely flexuous revolving lines; suture distinctly impressed or sub-channeled; aperture ovate; outer lip thin; inner lip not thickened and deflected partly over the small umbilicus. Length about .90 inch, breadth .76 inch; length of aperture .54 inch, breadth .36 inch; apical angle slightly convex, divergence 90°.

Locality and position. Same as preceding.

TURBO NEBRASCENSIS. Shell turbinate, length and breadth about equal; spire broadly conical; volutions about five, rounded, gradually increasing from the apex; surface ornamented by fine revolving striæ, crossed by delicate lines of growth, becoming distinct oblique wrinkles along the suture and round the umbilicus, the whole presenting an elegant cancellated appearance under a lense; suture distinctly impressed; aperture round; umbilicus moderate, round. Length .25 inch, breadth .26 inch; diameter of aperture .12 inch; apical angle somewhat convex, divergence 53°.

Locality and position. Yellow Stone river, one hundred and fifty miles from mouth. No. 4 of series.

TURBO TENUILINEATUS. Shell oblong or suboval, oblique, thin; spire somewhat elevated, acute at the apex; volutions about five, rounded, increasing rapidly from the apex; last one ventricose, extended in front; surface marked

with distinct lines of growth, crossed by rounded, thread-like lines, generally less than the spaces between, and somewhat irregular in size; between the latter there are also very fine parallel revolving striæ, only visible under a lens; suture apparently canaliculate; aperture broad ovate or oval; outer lip thin; inner lip straight above, and distinctly curved outwards below at its junction with the outer lip near the small umbilicus. Length .84 inch, breadth .68 inch; apical angle regular, divergence 78°; length of aperture .50 inch, breadth of do. .36 inch.

Locality. Moreau trading post. No. 5 of the series.

Rostellaria biangulata. Shell elongated; spire elevated, acutely conical; volutions seven or eight, convex, crossed by small nearly obsolete folds, last one having two distinct revolving carinæ on the middle, which diverge in passing upon the expanded lip, and terminate in two more or less saliant angles at its outer margin; surface marked by fine very faint lines of growth, crossed by small revolving thread-like lines about equal the intermediate spaces, on the spire and upper part of the last turn, but more distinct and alternating with smaller ones on the lower part of the body volution; suture linear, sharply impressed; aperture unknown; outer lip thin, expanded, and extending more or less up the spire. Length .53 inch, breadth exclusive of the lip .21 inch; apical angle regular, divergence 37°.

Locality and position. Yellow Stone river, one hundred and fifty miles from mouth. No. 4 of the series.

Fusus Dakotaensis. Shell fusiform; spire conical, somewhat elevated; volutions about six, flattened or concave above, last one abruptly contracted into the canal below, and ornamented on the middle by two elevated revolving nodose carinæ, between which faint, broadly rounded, vertical folds pass from node to node. On the spire only the upper and most prominent carina is seen, while a third less distinct parallel ridge passes round lower down on the body whorl; whole surface marked by fine, regular lines of growth, crossed by rounded revolving lines, one of which, about midway between the two large carinæ, is stronger than the others; suture linear; aperture broad oval or ovate. Length from junction of canal and aperture to apex 1.03 inches, breadth .92 inch; length of aperture .48 inch, breadth .42 inch; apical angle regular, divergence 51°.

Locacity and position. Moreau trading post. No. 5 of the series.

Fusus Galpinianus. Shell small, fusiform; spire conical, acute; volutions five and a half to six, convex, last one sloping somewhat abruptly below into the short canal; surface marked by fine flexuous lines of growth, crossed by rounded little revolving bands or lines scarcely larger than the grooves between. About fourteen of these bands may be counted on the second volution; suture distinct; aperture narrow-oval, acutely angular behind, and sloping into the canal in front; outer lip thin and sharp; inner lip lying close upon the tortuous columella. Length 1.05 inches, breadth .42 inch; length of aperture (including canal) .53 inch, breadth .18 inch; apical angle regular or slightly convex, divergence 32°.

The above species is dedicated to Mr. C. E. Galpin, of Am. Fur Co.

Locality and position. Same as last.

Fusus contortus. Shell obliquely fusiform; spire elevated conical, acute at the apex; volutions five and a half to six, distinctly concave above, convex below, and ornamented by indistinct flexuous folds, which swell out into a row of prominent nodes round the middle; last volution gradually contracting below into a short canal; surface marked by fine flexuous lines of growth crossed by numerous elevated thread-like revolving lines, a little less than the spaces between; suture distinct; aperture ovate, widest above the middle, angular behind, and tapering forward; outer lip thin; inner lip closely folded upon the somewhat tortuous columella. Length about .90 inch, breadth .48 inch; length of aperture and canal .56 inch, breadth .20 inch; apical angle convex, divergence 45°.

Locality. Same as the preceding.

Fusus Culbertsoni. Shell elongate fusiform; spire elevated conical, acute; volutions about seven, convex, increasing gradually from the apex, and crossed nearly at right angles to the suture by six or seven strong rounded folds, which gradually become obsolete on the last near the aperture; last volution tapering gracefully and obliquely into the canal, which is of moderate length; surface marked by irregular lines of growth, crossed by flattened or rounded lines, somewhat larger than the spaces between; suture distinctly impressed, and when viewed from above is seen to deviate from a regular curve in following the waving outline of the folds; aperture lanceolate or narrow oval, acutely angular above and tapering gradually below. Length about 1.68 inches, breadth .50 inch; length of aperture and canal about .90 inch, breadth .23 inch; apical angle convex, divergence 28°.

We dedicate this species to Mr. Alexander Culbertson, of the Am. Fur Co.

Locality and position. Same as preceding.

Fusus flexuocostatus. Shell fusiform; spire somewhat elevated, acute at the apex; volutions six to six and a half, convex, traversed by strong, simple, flexuous folds nearly equalling the spaces between, and terminating above in small nodes so as to leave a shallow spiral groove below the suture; last whorl somewhat ventricose; surface ornamented by distinct lines of growth, crossed by small, elevated, thread-like, revolving lines, equal the spaces between on the upper part of the volutions, but more distant on the lower part of the last one; between the revolving lines and parallel with them, fine striæ may be seen by the aid of a magnifier; suture unknown; aperture oval or ovate. Length 1.05 inches, breadth .61 inch; length of aperture exclusive of canal .48 inch, breadth .30 inch; apical angle 46°.

Locality and position. Moreau river. No. 5 of series.

Fusus Newberryi. Shell fusiform, thick; spire conical; volutions five, flattened or concave above, convex below and ornamented round the middle with a row of more or less prominent nodes, which are sometimes prolonged on the last one into indistinct folds below; surface ornamented by irregular flexuous lines of growth, crossed by round, elevated, thread-like, revolving lines, sometimes greater and sometimes less than the spaces between; suture linear; aperture narrow ovate, angular above and scarcely distinct from the short canal below; outer lip thin or bevelled; inner lip closely spread upon the columella. Length 1.43 inches, breadth .81 inch; length of aperture (including the canal) .87 inch, breadth .32 inch; apical angle convex, divergence 55°.

We dedicate this species to Dr. J. S. Newberry, of Cleveland, Ohio.

Locality and position. Moreau river and Fox Hills. No. 5 of series.

Pyrula Bairdi. Shell pyriform; spire depressed; volutions five, rapidly increasing from the apex, flattened or slightly concave above and on the outside; last one large and ventricose, ornamented on the outside by two to three more or less prominent, revolving, nodose carinæ, only the upper of which is visible on the spire; surface marked by strong lines of growth, crossed by numerous elevated revolving lines, less than the spaces between, and sometimes assuming, on the outer and lower part of the last volution, the size of more distinct ridges; suture narrow, channeled; aperture ovate, abruptly contracted into the long canal below; columella tortuous, and deeply curved round the aperture; outer lip bevelled; inner lip thinly spread over the columella round the aperture, but leaving an umbilical groove about half way down the canal. Length 3.50 inches, breadth .2 inches; length of apertnre (including the canal) .3 inches, breadth 1.08 inches; apical angle nearly regular, divergence 114°.

Dedicated to Prof. Spencer F. Baird, of the Smithsonian Institution.

Locality and position. Same as last.

Fasciolaria cretacea. Shell small elongate, fusiform; spire elevated conical; volutions five to six, convex, last one a little more than half the entire length of

the shell, contracted below into a tapering canal; surface marked with flexuous lines of growth and little flat revolving bands about four times as wide as the grooves between; suture distinct; aperture narrow oval, angular above and narrowing gradually below; columella tortuous and having five small, oblique folds near the middle of the aperture.

Locality and position. Same as preceding.

Fasciolaria buccinoides. Shell elongate-oval or subfusiform; spire conical, acute; volutions five to five and a half, convex, last one somewhat ventricose and contracted below into a short canal; surface ornamented with fine regular lines of growth and small parallel folds, which are crossed by regular, round, elevated revolving bands, equal to or greater than the spaces between. Of these bands about fourteen may be counted on the second volution; suture distinctly impressed; aperture narrow, oval, or semi-elliptical; outer lip faintly grooved, and at intervals of about once for each turn becomes thickened and crenulated on the inside; inner lip closely spread upon the tortuous columella, and forming about the middle of the aperture two distinct oblique folds. Length .96 inch, breadth .49 inch; length of aperture and canal about .60 inch, breadth .23 inch; apical angle convex, divergence 54°.

This shell has much the general appearance of a *Buccinum*, having the form and surface markings of *B. decussatum* (Lamk.) an Eocene species from the Paris basin, but differs from the genus *Buccinum* in having two distinct folds on the columella, being in this respect more like *Fasciolaria*. The folds on the columella are not stronger, however, than we see in *B. fusiformis* of Deshays, another Tertiary species. We had once concluded to refer it with doubt to the genus *Buccinum*, but refer it to the genus *Fasciolaria*, at the suggestion of Dr. Gould, to whom we sent specimens. This genus, according to D'Orbigny, made its first appearance in the old world during the deposition of the true chalk.

Locality and position. Moreau and Fox Hills. No. 5 of the series.

Buccinum? Nebrascensis. Shell oval, thin; spire very short; volutions three to three and a half, convex, rapidly increasing from the apex, last one very large and somewhat ventricose; surface marked with distinct lines of growth, which are crossed by flattened, revolving bands, much wider on the upper part of the volutions than the shallow grooves between, but about equal to them on the lower part of the last turn. About seven or eight of these bands may be counted on the second volution; suture narrow, channeled; aperture large, subelliptical, angular above, and terminating in a rounded notch in front, the form of which is well defined by a sudden curve in the lines of growth on a broad spiral ridge round the outer edge of the pillar lip; outer lip very thin; inner lip thinly spread over the extremely tortuous columella. Length .77 inch, breadth .58 inch; length of aperture .61 inch, breadth .36 inch; apical angle convex, divergence 105°.

Being in doubt in regard to the generic relations of this shell, we sent specimens of it, and a few others, to the distinguished conchologist, Dr. Augustus A. Gould, of Boston, from whom we received in regard to it, the following remarks: "Its general form reminds one of *Natica*, and its revolving striæ of the subgenus *Naticina*. If we look at the base, however, we find a revolving ridge which is never found in the Naticidæ, but is peculiar to the Buccinidæ." Dr. G. further remarks that with the exception of the revolving striæ it agrees very nearly with the genus *Pseudoliva* of Swainson, which is not known to date back further than the Eocene. In many respects it resembles the Eocene *Buccinum obtusum* of Deshays, from the Paris basin, which forms the type of an Eocene genus established by D'Orbigny under the name of *Sulco buccinum*. Our shell has the form, revolving striæ, &c., of some species of D'Orbigny's genus, but wants the strong revolving sulcus, which is one of its principal characters. For the present we refer it to the genus *Buccinum*, though we suspect it may form the type of a new genus.

Locality and position. Same as last.

Capulus fragilis. Shell broadly conical, very thin; apex elevated, central; slopes slightly convex, divergence 80°; surface marked with fine, closely arranged, concentric striæ; aperture circular. Diameter of base 1.22 inch; height of apex about .74 inch.

It is with some doubt we refer this species to the above genus, as our specimen only consists of an internal cast with a few fragments of shell adhering; no muscular impressions are visible upon it, but the nipple at the summit appears to have occupied the interior of an attenuated and laterally curved apex.

Locality and position. Fox Hills. No. 5 of the series.

Genus HELCION (Montfort).

We have not yet had an opportunity of seeing the interior of any of the following patelliform shells, but, judging from external characters, they appear referable to the above genus as defined by D'Orbigny. They are all strictly symmetrical, with, as far as can be ascertained, thin, smooth, and nearly, if not quite entire borders.

Helcion sexsulcatus. Shell patelliform, longer than wide; apex between the centre and anterior margin depressed; lateral slopes nearly straight, divergence 100°; anterior slope slightly concave, and having two broad shallow grooves radiating from the apex to the antero-lateral edges; posterior slope convex, and having four broad shallow grooves radiating from the apex to the posterior and lateral edges; base or aperture oval; surface unknown. Length unknown, breadth about 1.29 inch, height .48 inch.

Locality and position. Yellow Stone, one hundred and fifty miles from mouth. No. 4 of the series.

Helcion patelliformis. Shell patelliform, thin, a little longer than wide; apex somewhat elevated, nearer the centre than the anterior margin; lateral slopes nearly straight, divergence about 90°; anterior slope straight or slightly concave, posterior convex, divergence of the two about 103°; surface marked with fine concentric lines of growth, which are crossed by very faint indications of fine radiating striæ, and on the anterior side by three or four scarcely perceptible, radiating cariuæ (the latter not always present); aperture broad, oval. Length 1 inch, breadth .84 inch, height .44 inch.

Locality and position. Same as last.

Helcion alveolus. Shell patelliform, thin, longer than wide; apex depressed, nearly central; lateral slopes convex and forming an angle of 80°; posterior and anterior slopes about equally convex, divergence 120°; surface marked with very fine concentric lines of growth; base or aperture elliptical or subovate, Length .63 inch, breadth .43 inch, heighth .17 inch.

Locality and position. Yellow Stoue river. No. 4 of series.

Helcion subovatus. Shell patelliform, longer than wide; apex depressed, situated about half way between the centre and the anterior margin; lateral slopes convex, and forming an angle of 80°; posterior slope more convex than the anterior, divergence of the two 104°; surface marked by faint, irregular, concentric undulations and imbricating lines of growth; base or aperture oval or subovate, extremities broadly rounded, the posterior end being a little wider than the anterior. Length 1.16 inches, breadth .81 inch, heighth .39 inch

Locality and position. Same as preceding.

Helcion carinatus. Shell very obliquely conical or bonnet-shaped, thin; apex elevated near the anterior margin, and directed forward; anterior and antero-lateral slopes profoundly concave; postcrior slope convex above and flattened or concave below. A single strong, rounded carina passes from the apex down the posterior slope, becoming gradually obsolete near the margin, while two or three much fainter ones radiate from the apex down the postero-

lateral slopes on each side of it. Six small indistiuct striæ radiate from the apex, two of which are directed forwards and outwards, and four backwards and outwards; faint, irregular, concentric undulations dimly indicate the progressive stages of growth; surface otherwise smooth; aperture circular. Diameter of aperture 1.93 inches, heighth of apex .80 inch.

Locality and position. Same as preceding.

Dentalium fragilis. Shell very thin, slender, gently curved from apex to base; surface ornamented by rounded, thread-like, longitudinal lines, which are crossed somewhat obliquely upwards from the inner to the outer side of the curve by very fine regular lines of growth. The longitudinal lines terminate abruptly a little below the apex, (where they number about fourteen) and increase in number by implantation, and diminish in size and regularity towards the larger end, so as to become nearly obsolete on the lower half of the shell; aperture circular. Diameter at the apex .05 inch, do. of a fragment .85 inch, below apex .13 inch, do. of largest fragment .19 inch; thickness of shell .02 inch; apical angle 3°.

The above species is closely allied to *D. gracilis*, Hall and Meek, (vol. 5, new series, Trans. Acad. Arts and Sciences, Boston) but differs in having much less prominent longitudinal striæ, and not more than half as thick a shell; while the aperture, which in the former is nearly always subcircular, in the preseut species is exactly circular.

Locality and position. Yellow Stoue river, one hundred and fifty miles above mouth. No. 4 of section.

Bulla volvaria. Shell narrow ovate, tapering gradually from below the middle upwards, and extended obliquely below; spire hidden, sometimes umbilicate; surface ornamented by faint lines of growth and shallow revolving striæ, about oue fifth as wide as the spaces between on the middle of the shell, but more closely crowded and irregular at the lower and upper extremities. Occasionally a much finer stria occupies one of the spaces between the others; aperture long, narrow, gently curved, rising above the summit of the body, about half as wide above the middle as below; lip thin, closely folded over the rudimentary umbilicus. Length .66 inch, breadth .36 inch.

Locality and position Moreau trading post. No. 5 of section.

Bulla minor. Shell minute, ovate, or elliptical; spire hidden, umbilicate; surface marked by elevated, sharp, revolving striæ, about equal to the grooves between; fine sharply elevated lines of growth, more distinct in the grooves than on the elevations, mark the surface in the other direction; aperture large, rising above the summit of the body, narrow and obtuse above, and wideuing gradually below. Length about .10 inch, breadth .05.

Locality and position. Moreau trading post. No. 5 of the series.

Bulla occidentalis. Shell oval or ovate, thin, ventricose, widest a little above the middle, rounded at the summit and somewhat obliquely extended in front; spire hidden, umbilicate; surface unknown. Indistinct lines of growth, and stronger revolving striæ less than the spaces betweeu are seen on the cast; aperture curved, narrow behind, rising above the summit of the body, and widening chiefly on the inner side below; lip slightly curved outwards rouud the lower part of the aperture. Length .44 inch, breadth .28 inch.

Locality and position. Yellow stone river. No. 4 of the series.

We have other new species of Gasteropoda from the Cretaceous formations of the upper Missouri, but refrain from indicating them out of deference to friends having specimeus of the same which they wish to describe.