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XVII.

Descriptions of New Species of Fossils, from the Cretaceous Formations of Nebraska, with Observations upon BACULITES OVATUS and B. COMPRESSUS, and the Progressive Development of the Septa in Baculites, Ammonites, and Scaphites.

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(Communicated June 27, 1854.)

THE collections which have furnished the following new species from the cretaceous formation of the Upper Missouri, were made in the summer of 1853, by Mr. F. B. Meek and F. V. Hayden. The collection of Mammalian remains from the Tertiary period has been placed at the disposal of Professor Leidy, for his forthcoming new memoir upon the fossil remains of that region.

CALLIANASSA DANAI, *n. sp.* (Fragment.)

PLATE I. FIG. 1, *a, b.*

Exterior surface convex, inner surface flat, upper and lower edges obtusely angular; fingers nearly as long as the hand; upper one nearly triangular in section and depressed above near its articulation, and marked along its upper edge at regular intervals by four small foramina, outer side depressed above the middle and towards the lower margin, and marked by two large foramina, dividing the whole into three nearly equal spaces; upper angle obtuse, lower edge sharp and smooth, arcuate from the apex back a little more than half the distance to the base, from which point it curves again towards the articulating extremity, leaving the widest part near the middle. Lower finger narrower than the upper, equal in length, bending slightly downwards from the hand, and thence gradually curving upwards to the extremity, marked on the upper slope of the outer angle by two foramina, one near the base and one near the

centre. Section sub-triangular, centre of the outer side forming an obtuse angle, the lower edge more acute, the inner side flat, and the upper edge acute, and finely denticulated near the hand, gradually becoming less prominent and finally obsolete on the outer half of the edge. Surface smooth and polished, showing no external marks, but, through the translucent shell, a kind of reticulation, owing to inequalities beneath.

Locality and Position. — Great Bend of the Missouri. Lower part of division No. 4 of Section.

LINGULA SUBSPATULATA, *n. sp.*

PLATE I. FIG. 2, *a, b.*

Shell sub-elliptical, margins regularly curved above, straight or little contracted below the centre; base sub-truncate; surface marked by faint concentric striæ, and a few strong wrinkles parallel with the lateral margins. Viseral impression trifoliate.

The only specimen we have is imperfect, and the shell is preserved only on the margins. It has nearly the proportions of *Lingula Rouliniana*, (D'Orbigny, *Pal. Française, Terrains Crétacés*, Brach. p. 10, pl. 490, fig. 1,) but differs in having its greatest width above the middle, while in the European species the greatest width is below the middle. Our species is also more abruptly rounded or sub-truncate at the base. The surface markings are similar.

Locality and Position. — Near Red Cedar Island, thirty-five miles below Fort Pierre. Division No. 4 of Section.

CAPRINELLA CORALOIDEA, *n. sp.*

PLATE II. FIG. 3, *a-f.*

Our specimen is a portion of the larger valve extending about two and a half inches from the apex, and partially invested with the thick, fibrous shell. From this is drawn the following description.

Inferior valve spiral, rapidly increasing from the apex towards the aperture; when divested of the outer fibrous shell, the internal septate part is seen to be spirally curved, and rapidly increasing in size; a longitudinal groove or depression extends from the apex along the back of the curve to the larger extremity, crossed by numerous irregular septa, which pass from the inner side outwards and upwards.

This interior septate portion is enveloped in a thick, fibrous shell, which, in the

imperfect specimen, is much thicker on the inner than on the outer side of the volution; fibres longitudinal, consisting of four or six angled, more or less flattened prisms, which are crossed at regular intervals of less than their diameter by septa or diaphragms, and externally marked by fine transverse striæ, the whole presenting an appearance like a small columnar Favosite or Chætetes.

This specimen differs from the species figured by D'Orbigny, in being curved not exactly in the same plane, in increasing much more rapidly in size from the apex, and in having the fibrous portion of the shell so thick upon the inner side of the volution as to bring the sides in contact if continued a single turn. The septa are also much more irregular than in the European species, those which are distinct upon the back of the shell often converging so that two unite in a single one on the inner side of the volution.

The differences noticed suggest an inquiry whether the generic description of *Caprinella* should be modified; since it seems impossible that a shell of this character, from its extreme thickness on the inner side, and from its rapidly increasing size, could have formed several volutions. An examination of more perfect specimens will probably show the necessity of such modification, or the establishment of a new genus.

Locality and Position.—Sage Creek, Nebraska. Upper part of division No. 4 of Section.

PECTEN RIGIDA, *n. sp.*

PLATE II. FIG. 4, *a, b, c.*

Shell obovate, height greater than length, very gradually narrowing towards the hinge; valves equally convex; hinge line short; wings minute, nearly equal, anterior one truncate, posterior one pointed, striated upon the surface; left or inferior valve marked by strong, concentric undulations; superior valve smooth, or marked in the exfoliated shell by faint radiating striæ. Length, .19 inch; height, .23 inch.

The strong concentric undulations of the inferior valve are likewise conspicuous on the cast, and are there crossed by radiating striæ. The superior valve, which has the shell partially exfoliated, shows only faint radiating striæ without concentric undulations as in the other valve. Perfect specimens may perhaps show other markings on the superior valve not visible in these.

Locality and Position.—Sage Creek, Nebraska. Upper part of division No. 4 of Cretaceous Strata.

AVICULA HAYDENI, *n. sp.*PLATE I. FIG. 5, *a, b.*

Shell small, sub-rhomboidal, oblique; beak small, pointed, slightly elevated above the hinge line; hinge line straight, less than the length of the shell, and pointed at the posterior extremity, anterior extremity short, rounded; posterior margin obliquely truncate; no line of demarcation between the wing and body of the shell; basal margin forming a regular elliptic curve; surface marked by sharp strong ribs, with sometimes an intermediate smaller one, crossed by faint concentric undulations and parallel fine lines of growth. Length, .3 inch; height, .22 inch; hinge line making an angle with the posterior slope of about 129°.

All the specimens we have seen are of the left valve only. The shell is extremely thin and fragile, and preserved only upon portions of one of our specimens. Some individuals show a depressed line along the hinge margin.

Locality and Position.— On the Missouri, near Red Cedar Island, twenty-five miles below Fort Pierre. From division No. 4 of Section.

LUCINA SUBUNDATA.

PLATE I. FIG. 6, *a, b.*

Shell sub-orbicular; length a little greater than height; beak little elevated, sub-central or nearer the posterior side; anterior margin broadly rounded, posterior one sloping from the beak and rounded below; surface with concentric undulations and finer parallel lines, crossed by very minute radiating striæ. Length, .4 inch; height, .36 inch; width, .2 inch.

This shell bears some general resemblance to *L. cornuelana* of D'Orbigny, (*Terrains Crétacés*, p. 116, pl. 281, fig. 3,) but the beaks are much less elevated, the anterior end much broader, and the concentric undulations larger and less uniform. This species strikingly possesses the characters of the genus *Lucina*, and may readily be distinguished among the smaller bivalves from this region.

Locality and Position.— Sage Creek. Upper part of division No. 4 of Section.

CYTHEREA ORBICULATA, *n. sp.*

PLATE I. FIG. 7.

Shell thick, sub-orbicular; beak moderately elevated and near the anterior side;

posterior margin regularly rounded; surface marked by fine equal concentric lines. Length, .18 inch; height, 1 inch; width, .66 inch.

The form is neatly rounded throughout, the umbones curving gently towards the antero-cardinal margin. Our specimens of this shell are all imperfect.

Locality and Position. — On the Missouri, five miles below James River. Calcareous beds of the base of division No. 2 of Section.

CYTHEREA TENUIS, *n. sp.*

PLATE I. FIG. 8, *a, b, c.*

Shell thin, ovate-orbicular, length and height nearly equal; beak elevated, nearly central; anterior and posterior extremities rounded, the latter somewhat broader; surface marked by concentric undulations and fine parallel striæ. Length, .4 inch; height, .36 inch.

This is a fragile shell with beaks more nearly central than the preceding species. It is much more delicate than any shell of this family which has been found in the cretaceous formation of this region.

Both this and the preceding species are referred to the genus *Cytherea* from external form, no opportunity having offered of examining the hinge.

Locality and Position. — Same as preceding.

CRASSATELLA EVANSII, *n. sp.*

PLATE I. FIG. 9, *a-e.*

Shell obliquely ovoid (varying somewhat in form), ventricose; beaks much elevated; anterior margin short, rounded below; postero-cardinal margin sloping abruptly downwards, the extremity sub-truncate; basal margin distinctly and neatly crenulated on the interior; escutcheon broad lanceolate, well defined; lunule distinct, but margins not strongly defined; surface somewhat undulated, marked by fine irregular striæ or lines of growth; muscular impressions strongly marked.

This shell is probably identical with the imperfect cast figured by Dr. D. D. Owen in his Report, Pl. 7, fig. 9, as a *Pectunculus*. Our specimens showing the interior of the hinge, muscular impressions, etc., are from the same position in the series, and from the same district of country. The shell is a well-marked *Crassatella*, presenting all the ordinary characteristics of the genus, in the cardinal and muscular characters. It is abundant, occurring entire and in the condition of casts. The species may be readily

distinguished by its oblique form and extended beaks, its ventricose character, and the fibrous or striated structure of the interior, produced by exfoliation. It occurs more commonly in the septaria, which furnish only casts, the shell adhering to the rock on breaking, while the entire specimens are only obtained from the clay. Length, 1.4 inches; height, .97 inch; width, .70 inch.

Locality and Position. — Sage Creek, in the upper part of division No. 2 of Section.

PECTUNCULUS SIOUXENSIS, *n. sp.*

PLATE I. FIG. 12.

Shell sub-orbicular (in the cast); beaks elevated, nearly central; longer than high, nearly convex; anterior margin regularly rounded; posterior margin somewhat obliquely sub-truncated; basal margin without crenulations; cardinal margin curved and marked by fine dividing crenulations; posterior muscular impression strong.

The specimen described is a cast preserving the form of the shell, and showing very distinctly the crenulations of the cardinal margin. The external markings of the shell are unknown.

Locality and Position. — Mouth of Big Sioux, on the Missouri River, in a ferruginous sandstone. Division No. 1 of Section.

NUCULA SUBNASUTA, *n. sp.*

PLATE I. FIG. 10, *a, b, c.*

Shell sub-elliptical, contracted towards the posterior extremity, somewhat ventricose in the middle; a shallow groove or depression extending obliquely from the beak to the base of the shell, where it produces a slight indentation in the regular elliptic curve of the basal margin; escutcheon margined by a broad shallow groove, extending from near the beak, and causing a faint emargination near the posterior extremity above; beaks nearly central, small and incurved; shell marked by faint striæ or lines of growth, and a few broader concentric undulations which give a scarcely perceptible inequality to the surface; crenulations of the hinge line very fine. Length, .78 inch; height, .45 inch; width, .36 inch.

This neat little shell is sufficiently well marked to be readily distinguished, particularly by the slight impression on the edges of the shell above and below near the posterior extremity. The crenulations are fine and slender; and in one specimen the erosion of the shell exhibits the crenulated edge of a former hinge line, at some dis-

tance from the present one; showing that the shell increased by additions to its cardinal, as well as ventral margin.

Locality and Position.—Sage Creek. Upper part of division No. 4 of Section.

NUCULA VENTRICOSA, *n. sp.*

PLATE I. FIG. 11, *a, b.*

Shell ventricose in the middle and depressed at each end, ovate, prolonged posteriorly, somewhat regularly rounded in front, contracted behind; a broad shallow impression extending from below the beak to the postero-ventral margin of the shell; beaks elevated, nearer to the anterior extremity; basal margin regularly rounded to near the posterior end; surface marked by regular, distinct concentric ridges, which are strong upon the middle of the shell, and become somewhat abruptly obsolete as they pass to the depressed parts at either extremity; hinge line slightly curved; crenulations strong. Length, .14 inch; height, .09 inch; width about the same as height.

This minute shell is distinguished by its ventricose middle and depressed extremities, and by the strong concentric ridges becoming almost abruptly obsolete in passing from the ventricose portion of the shell to the flatter extremities; the teeth of the hinge line are comparatively strong. The mature character of the shell is indicated by its thickness, as well as by the strong concentric ridges; while several casts of the same dimensions were found associated with it.

Locality and Position.—Sage Creek. In division No. 4 of Section.

CAPULUS OCCIDENTALIS, *n. sp.*

PLATE I. FIG. 13, *a-d.*

Orbicula (undet), OWEN, Report. Pl. VII. Fig. 11.

Sub-orbicular, patelliform; base nearly flat; very depressed, conical above; the apex intermediate between the centre and margin; lower surface marked by fine lamellose imbricating radiations, which diverge from a point nearly opposite the apex of the convex side, and are crossed by concentric undulations. The convex side is distinctly marked by a horseshoe-form muscular impression, which is connected at its two extremities by a fainter parallel impression; muscular impression marked transversely by radiating striæ, which are continued obscurely beyond it to the margin, and which, in the muscular impression, are crossed by finer concentric lines.

Small fragments of pearly nacreous shell adhere to a few points on the flatter side, but they present no markings of any kind.

We have identified this fossil as the *Hipponix* (Defranc), *Pileopsis capulus*, described under the genus *Cabocho*n by Des Hayes. Our specimen is the smaller valve, very distinctly marked on its upper surface by the muscular impression which may be the cast of the interior of the other valve, and on the lower surface by imbricating striæ, very much like those of the *Hipponix* (*Pileopsis*) *patelloidea* (Des Hayes, *Coc. Foss.*, Tom. II. Pl. III. figs. 23, 24, and 25). It may also be compared with other species of this genus as figured by Des Hayes.

Locality and Position.—Sage Creek, Nebraska, from division No. 4 of the Section of the cretaceous formation.

INOCERAMUS SUBLÆVIS, *n. sp.*

PLATE II. FIG. 1, *a, b.*

Shell comparatively thin, moderately convex, length about one fifth more than height; hinge line long and straight, forming an angle of about 130° with the front; anterior extremity rounded; posterior side long and rounded at the extremity; beaks small, scarcely elevated above the hinge line; surface with nearly obsolete concentric undulations, and fine regular concentric striæ, which continue almost as distinct where the shell is partly exfoliated.

The most striking feature of this shell is the almost entire absence of concentric undulations, by which it will at once be distinguished from any species heretofore described from that region, or even in this country. It differs from the *I. sagensis* of Owen in the lesser obliquity of the shell, in the more extended and rounded anterior extremity, and in the smaller and less elevated beaks, while the entire shell is less convex. The fine equal concentric striæ, and faint radiating lines with obsolete undulations, are usually sufficient to distinguish this shell, even where the surface is much exfoliated. Our specimens do not show the whole outline, but it can be inferred by the direction of the concentric striæ.

Locality and Position.—Great Bend of the Missouri, in division No. 4 of Section.

INOCERAMUS CONVEXUS, *n. sp.*

PLATE II. FIG. 2, *a, b.*

Shell ovate, very convex, height a little more than three fourths of length; beaks prominent; hinge line long and straight, forming an angle with the anterior margin of

about 145° ; anterior side somewhat extended and regularly rounded; posterior side extended (and probably subtruncated). Shell marked by strong undulations, which are simple at their extremities, while some of them become divided towards the centre of the shell, where they are prominent, being less conspicuous towards the beak, and almost obsolete towards the base of the shell. Concentric lines mark the surfaces of exfoliated specimens somewhat irregularly.

This species differs from the *I. sagensis* in the less obliquity of the form, and the greater extension of the anterior side of the shell, giving an angle with the hinge line of 50° greater than in that species. The concentric undulations in *I. sagensis* are more simple than in this species, and more persistent towards the base of the shell, while this is more ventricose in the middle. This shell appears to differ sufficiently from all described species known to us, to render it easily recognizable.

Locality and Position. — Sage Creek. Upper part of division No. 4 of Section.

INOCERAMUS TENUILINEATUS, *n. sp.*

PLATE II. FIG. 3, *a, b.*

Shell obliquely rhomboid-ovate, height a little more than two thirds the length; beaks towards the anterior extremity, elevated, ventricose, and incurved; hinge line straight, making an angle with the anterior margin of about 100° ; posterior side extremely elongated and rounded at the extremity; surface marked by irregular undulations, which are nearly obsolete on exfoliated specimens. A small portion of the external surface remaining near the anterior extremity, shows minute crowded concentric striæ.

This shell has the form and obliquity of *I. sagensis*, but the beaks are more elevated and incurved, and the umbonial region more ventricose, while the undulations are much less conspicuous, irregular, and more obtuse. The portion of the external surface observed has the striæ much finer and more closely crowded than in *I. sagensis*. This species resembles in form the *I. impressus* of D'Orbigny, (*Terrains Crétacés*, p. 515, pl. 409,) except in the extension of the hinge line, which we have not been able to see in its perfect condition.

Locality and Position. — Sage Creek and Great Bend of the Missouri. Division No. 4 of Section.

INOCERAMUS CONRADI, *n. sp.*

PLATE II. FIG. 5, *a, b.*

Shell very thin, ventricose; surface marked by numerous fine concentric striæ or

lines of growth, apparently destitute of undulations, structure fibrous, fibres coarse and angular.

The only specimen we have of this fossil has an appearance as if the two valves had been crushed in the direction of the length of the shell, presenting a view of the anterior end. We refer this specimen to the genus *Inoceramus*, for the reason that the shell is fibrous in its texture, being thicker towards the margin and thinner towards the beaks, precisely similar in these respects to the external fibrous portions of the shells of this genus.

In its surface markings this shell differs from any cretaceous species hitherto described, so far as known to us, either in this country or in Europe; and more resembles the Liasic and Oolitic species as figured by Goldfuss; and in its surface marking it may be compared with *I. levigatus*, (Munster) Goldfuss, *Petrefacta*, II., p. 111, ta. 109, fig. 6. This species is associated with *I. fragilis* and *Ammonites percarinatus*.

Locality and Position.—On the Missouri River, five miles below the mouth of Vermilion River. Lower part of division No. 2 of Section.

INOCERAMUS FRAGILIS, *n. sp.*

PLATE II. FIG. 6, *a, b.*

Shell small, thin, obliquely rhomboid-obovate, height a little less than length; beaks acute, pointed forward; hinge line straight, or slightly concave, extended somewhat less than the length of the shell; forming a nearly right angle with the anterior side; marked by comparatively strong undulations, which expand upon the body of the shell, and become less prominent towards the base; surface of the shell marked by finer concentric lines.

The shell of this species is extremely fragile, and appears to be fibrous throughout its entire thickness. In general appearance it resembles the *Inoceramus mytiloides* of Mantell, as figured by Roemer, but the hinge line is more extended, and forms a more obtuse angle with the anterior side, and the height is proportionally greater. It differs extremely from the *I. mytiloides* as given by Goldfuss; and it also differs widely from D'Orbigny's figures of *I. problematicus*, which Roemer regards as identical with *I. mytiloides* of Mantell.

Locality and Position.—On the Missouri River, five miles below the mouth of Vermilion River. In the lower clay beds of division No. 2 of Section; associated with a small species of *Ammonites*, etc

NATICA OBLIQUATA, *n. sp.*PLATE III. FIG. 1, *a, b.*

Shell longer than wide, very obliquely sub-ovate, spire little elevated. Volutions three to three and a half, convex; last one ventricose, prolonged in front. Suture deeply impressed. Surface marked by faint, very fine, closely arranged lines of growth, which are crossed by fine, nearly obsolete, revolving lines. Aperture ovate, somewhat oblique. Umbilicus small, and partly closed by the deflected pillar lip. Columella marked with a distinct opercular impression, which continues down to the base of the aperture. Spiral angle 92° . Length, .36 inch; breadth, .32 inch. Body volution, .7 of whole length.

Locality and Position. — Great Bend of the Missouri. From the clay beds of division No. 4 of Section.

NATICA CONCINNA, *n. sp.*PLATE III. FIG. 2, *a - d.*

Shell obliquely sub-ovate; length and breadth nearly equal. Spire little elevated. Volutions three and a half, convex; last one ventricose. Suture sharply impressed. Surface nearly smooth, or marked only with exceedingly fine, closely arranged lines of growth, which are invisible to the naked eye. Aperture ovate, obtuse at both extremities. Umbilicus of medium size, round. Columellar lip not thickened, slightly deflected upon the body volution, but not so as to cover any part of the umbilicus. Spiral angle 92° . Length, .22 inch; breadth, .23 inch. Body volution .75 of the whole length.

In form this shell bears much resemblance to the *N. obliquata*. The difference in size, however, can hardly be due to age, as this appears to be a mature shell.

Locality and Position. — Sage Creek. Higher part of the upper clay formation, No. 4 of Section.

NATICA PALUDINÆFORMIS, *n. sp.*PLATE III. FIG. 3, *a, b, c.*

Shell sub-rhomboidal, obliquely conical above, prolonged below; spire extremely elevated; volutions five to five and a half, convex; suture deeply impressed or sub-canalicate; surface ornamented with numerous fine, closely arranged lines of growth,

which are crossed by fine, slightly undulating, sub-equal, revolving lines, presenting under the magnifier a beautiful cancellated appearance. Aperture oval, approaching sub-ovate, narrower above, oblique; outer lip thin; pillar lip not thickened; umbilicus obsolete or none. Spiral angle 57° . Length (of largest specimen), .9 inch; breadth, .6 inch. Last volution, .6 of whole length.

This shell resembles very closely the *N. cassisiana* of D'Orbigny, (*Terrains Crétacés*, p. 166, pl. 175, figs. 1-4,) but differs in its more acutely elevated spire. The surface markings are also quite different, the lines of growth being regular and distinct, while the revolving lines are not punctate, as in D'Orbigny's species; and the aperture of the latter is proportionally wider below. In general form this species approaches the *N. clementina* and *N. lævigata* among the Cretaceous species, and several Oolitic species figured by D'Orbigny, *Pal. Française, Terrains Jurassiques*.

Locality and Position. — Great Bend of the Missouri River and Sage Creek, division No. 4 of the Section.

ACTEON CONCINNUS, *n. sp.*

PLATE III. FIG. 4, *a-d.*

Shell globose or sub-oval; spire very short; volutions three and a half to four; suture narrow, but distinct; surface brilliant, with a porcelain-like polish, and ornamented with about thirty equidistant punctate revolving grooves or striæ. Aperture narrow, semilunar, contracted at the posterior extremity, rounded in front. Columella with one strong fold at the base, and a broad, deep spiral depression above it. Spiral angle about 100° . Length, .17 inch; breadth, .15 inch. The last volution .88 of whole length.

Locality and Position. — This beautiful little species is found at Sage Creek, in connection with *Baculites ovatus*, *B. compressus* (Say), *Scaphites nodosus* (Owen), &c. Also at Great Bend of the Missouri. In the upper and lower parts of No. 4 of Section.

BUCCINUM? VINCLUM, *n. sp.*

PLATE III. FIG. 5, *a, b.*

Shell below the medium size, elongate-ovate; spire moderately elevated; volutions about five or six, convex, regularly rounded; suture strongly impressed; surface marked by numerous strong longitudinal folds, and at irregular intervals with strong varices; fine lines of growth parallel to those ridges cover the entire surface; these

are crossed by rounded, elevated revolving bands, separated by spaces less than twice their width. Aperture unknown; canal —? Spiral angle about $4^{\circ} 50'$; length of imperfect shell, .6 inch. Last volution more than half the whole length; breadth, .35 inch.

This shell has the general aspect of *Buccinum*, though its superficial characters leave some doubts, which, from the imperfection of the base of the shell, cannot be entirely removed by the most careful examination of our specimen. The surface has been marked by several strong varices, which in this specimen are all exfoliated, leaving a groove, with several pits or indentations formed by the denticulations of the lip. The elevated revolving bands constitute a distinguishing feature of the shell, having a uniform character, and appearing like strips of enamel laid over the surface.

Locality and Position. — Great Bend. Lower part of division No. 4 of Section.

FUSUS SHUMARDII, *n. sp.*

PLATE III. FIG. 6, *a, b, c.*

Shell elongate fusiform; spire elevated; volutions six or more, moderately convex; suture defined, not deeply impressed; surface marked by strong longitudinal obtuse folds, which are equal to the spaces between them, and by finer lines of growth, crossed by strong elevated revolving bands wider than the spaces between them, with sometimes an intermediate smaller one. Aperture slightly oblique, narrow, obtusely angular behind, and gradually narrowing in front into the prolonged canal; canal slightly bent and twisted. Spiral angle about 35° . Length, .66 inch; width, .25 inch. The last volution .55 of the whole length.

The almost equal proportions between the spire and length of aperture, and the elongated form of the shell, are conspicuous features. The longitudinal folds are slightly curved on the volutions of the spire; the revolving bands are flat, and under a magnifier show well defined, angular edges.

Locality and Position. — Great Bend of the Missouri. Lower part of division No. 4 of Section.

FUSUS CONSTRICTUS, *n. sp.*

PLATE III. FIG. 7, *a - d.*

Shell fusiform; spire moderately elevated (imperfect above in our specimen); volutions five or six, convex; suture distinct; surface marked by strong longitudinal

rounded folds, which are about equal to the spaces between them; crossed by revolving bands, wider than the spaces between them, and distinctly defined upon the longitudinal folds and in the spaces. Aperture narrow, oblique, obtusely angular behind, gradually contracting in front into a narrow canal; outer lip thick; columella broad; a distinct spiral groove or constriction marking the junction of the canal with the inflated part of the last volution. Spiral angle, 52° . Breadth, .1 inch.

This shell presents all the external characters of *Fusus*, but the imperfection of the columella renders it impossible to determine fully its character. The impressed or constricted line at the base of the last volution passes around, parallel with the revolving lines, into the aperture, and may have produced a fold upon the inner lip, which might be a sufficient reason for removing it from this genus. The suture is a narrow constricted line, impressed nearly at right angles to the direction of the spire, and the depressions between the longitudinal folds are terminated abruptly above, before reaching the suture, by an irregular ridge caused by the extension and thickening of the upper extremities of the folds.

Locality and Position. — Sage Creek. Upper part of division No. 4 of Section.

FUSUS? TENUILINEATA, n. sp.

PLATE III. FIG. 8, *a-c*, and fig. 9, *a-c*.

Shell elongate-terete; volutions (number unknown) slightly convex in the middle, last one flattened, or sometimes slightly concave above the middle; aperture sub-rhombic, terminating in an acute angle behind, and narrowing in front into a canal; surface marked by very fine, undulating, closely arranged revolving lines, which are stronger immediately below the suture; suture plain, linear. Spiral angle about 25° ; breadth, .37 inch.

The only specimen in our collection is a fragment consisting of about two and a half volutions, the last one too imperfect to admit of the determination of the form of the aperture. Another fragment, fig. 9, *a, b*, is from the collection of Dr. Evans, now in the possession of Dr. Shumard in St. Louis. The aperture in this one is nearly entire, and, where partially exfoliated, shows in some places a thickening of the shell, with impressions of crenulations, as if the growth had been interrupted at intervals. It is with much doubt that this shell is referred to the genus *Fusus*.

Locality and Position. — Sage Creek. Upper part of division No. 4 of Section.

ROSTELLARIA FUSIFORMIS, *n. sp.*PLATE III. FIG. 10, *a, b.*

Shell elongate, fusiform; spire elongated; volutions (number unknown) moderately convex, marked by numerous regular rounded oblique flexuous folds, which terminate abruptly above in small indistinct nodes, giving a sub-coronate aspect to the upper part of the volutions; surface unknown; suture distinct and separated from the row of nodes below it by a shallow depression; aperture elongate, widest near the middle, and narrowing anteriorly into a prolonged canal. Spiral angle 35° ; breadth, 1.1 inch.

Our specimen is imperfect at both extremities, and so exfoliated as to preserve none of the surface markings. The folds on the last volution appear to grow more irregular and obscure towards the aperture. The outer lip is imperfect, and the adhesion of stony matter to the columella prevents the positive determination of the generic characters; but the general aspect of the surface, the longitudinal folds of the volutions, with the absence, as far as seen, of the characteristic features of other genera, induces its reference to the genus *Rostellaria*. In the broken upper extremity of the shell, a few faint spiral bands are visible, which, if continued, would mark the columella; but owing to the exfoliation of the specimen, they are not preserved.

Locality and Position.—Sage Creek. Upper clay or upper part of division No. 4 of Section.

DENTALIUM GRACILIS, *n. sp.*PLATE III. FIG. 11, *a-c.*

Slender, terete, gradually enlarging from the apex; section sub-oval, nearly circular; surface distinctly marked by rounded, threadlike striæ, which are irregular in size, and increase in number by implantation between the larger ones, from the apex towards the aperture, having about twenty-five near the apex and fifty-two at a point where the diameter is twice as great, and increasing in the same ratio as far as observed; crossed obliquely by extremely fine equal striæ, which ascend from the outer to the inner side of the curve. Spiral angle 3 to $3\frac{1}{2}^{\circ}$. Longest diameter of largest fragment, .2 inch; aperture of the same, .14 inch; diameter of smallest fragment, near the apex, .08 inch.

This we believe is the first species of this genus described from the cretaceous formation of this country.

Locality and Position.—Sage Creek. Upper part of division No. 4 of Section.

HELIX LEIDYI, *n. sp.*PLATE III. FIG. 12, *a, b.*

Shell sub-globose, wider than long; spire elevated; volutions four or five, last one large and ventricose; suture distinct; surface unknown; aperture unknown; outer lip reflected; umbilicus small, or perhaps closed. Spiral angle about 105° . Length, .95 inch; breadth, 1.14 inches. The last volution .65 of the whole length.

Our specimen is merely an internal cast with a few fragments of the shell adhering, no portions of which retain the surface markings; but faint impressions of coarse, regular lines of growth are left by the interior of the shell upon the cast. The aperture is distorted; though it was apparently wider than long. At the base of the shell the cast shows a distinct reflection of the lip.

Locality and Position. — Near the head of Bear Creek, Mauvaises Terres, turtle and bone bed. Eocene Tertiary.

AMMONITES COMPLEXUS, *n. sp.*PLATE IV. FIG. 1, *a-f.*

Discoid; umbilicus deep, outer volution covering one half to two thirds of the next one within; volutions five or more, ventricose, nearly twice as wide as high; ornamented on the ventral edge by about ten or twelve transverse nodes, slightly elevated, and extending outwards in bifurcating annulations, which cross the back of the shell, uniting again on the opposite side in the same manner. Between these annulations are often other intermediate ones, which are equally prominent on the back of the shell, and die out on the ventral edge.

These nodes, although existing in the young shell, are scarcely prolonged into annulating ridges, and the back of the shell is smooth, or marked only by the ordinary lines of growth.

In a young specimen of .64 inch in diameter, aperture .34 inch high, and .49 inch wide, septa formed of three symmetrical lobes on each side. Dorsal lobe as deep as the dorsal saddle, but wider, deeply divided at its extremity, and ornamented by two large terminal branches, the outer sides of which are deeply sinuate, a large lateral oblique branch midway between the apex and base of the lobe. Dorsal saddle deeply divided at the extremity into two unequal parts; the upper one again deeply bifurcate, divisions digitate at the extremities; ventral division bifid at the tip; a small branch on each side opposite the extremity of the

auxiliary lobe. Superior lateral lobe extremely contracted in the middle by the lateral branches of the saddle; divided towards its extremity into three unequal branches, the terminal one trifid at its extremity, the lateral ones scarcely digitate; two smaller lateral branches towards the base. Lateral saddle in form like the dorsal saddle, with the ventral division larger and bipartite, corresponding to the dorsal division of the other. Inferior lateral lobe shorter than the superior; contracted near the middle, divided into three sub-equal branches, the lateral ones irregularly digitate, and the terminal one trifid. Ventral saddle oblique, divided by the auxiliary lobe into two branches, which are again bifurcate, with the extremities obtusely bifid. Ventral lobe much smaller and shorter than the inferior lateral lobe, sub-equally tripartite, with the divisions sub-digitate. A small bilobed saddle on the ventral side of the last lobe.

The characters here given are derived from a small specimen, (Pl. IV. fig. 1, *a*,) and from the inner volutions of an older one, (fig. 1, *b*, *c*,) while in the outer volutions of the same specimen the lobes and saddles become very much crowded together, and exceedingly complicated in their structure; the division in the dorsal lobe becomes much deeper, all the divisions already noticed are more complex, the sinuosities extended in depth, the simple digitations become complex ramifications, with each division again sinuous on the edges, illustrating in a remarkable manner the development of this complicated structure as the animal increases in age and dimensions. In the young specimen figured, the septa in the interior volutions present the simplicity of those of *Goniatites*; while the outer septa of the same specimen exhibit the structure described and figured.

In the older specimen, (Pl. IV. fig. 1, *b*,) the outer septa furnish the extremely complex structure given in figs. 1, *e*, and 1, *f*, which include the dorsal lobe and a part of the dorsal saddle, as well as the superior lateral lobe, disconnected from the preceding parts; this being as far as the imperfection of the specimen and the extreme complication of the structure would allow one to follow its divisions; while the inner volutions present precisely the same structure as the outer volution of the younger specimen.

This species resembles in general form and proportions the *A. Mantellii* of Sowerby, but the annulating ridges are less strong, and the nodes on the inner edge very distinct. There is a greater difference, however, between the two species in the form and details of the lobes of the septa.

Locality and Position. — Great Bend on the Missouri. Lower part of division No. 4 of Section.

AMMONITES PERCARINATUS, *n. sp.*PLATE IV. FIG. 2, *a-c.*

Discoidal, depressed; umbilicus wide and shallow; volutions about four or five, all visible in the umbilicus, scarcely one fourth of each embraced in the succeeding one; shell thin; surface marked by thirty-eight to forty-five prominent flexuous sharp ribs some of which originate in the umbilicus, and others upon the latero-ventral margin, and all extend to the dorso-lateral edge, where they bend abruptly forward, and terminate before reaching the dorsal line, which is marked by a thin sharp carina extending to the aperture. Ribs thickened and sometimes nodose towards the periphery.

Our specimens are all casts of the interior with fragments of the shell adhering, and the condition is such as to give no means of determining the character of the septa. Among American species, it resembles in general appearance the *A. abyssinius* of Morton, (*Jour. Acad. Nat. Sci.*, Vol. VIII. p. 209, Pl. X. fig. 4,) from which it may be at once distinguished by its wider umbilicus and dorsal carina. The same remarks would apply to a comparison of this species with the *A. splendens* of Sowerby, in its young state, as given by D'Orbigny (*Terrains Crétacés*, p. 222, Pl. 63, fig. 3). It differs also from the *A. helius*, D'Orbigny, (*loc. cit.*, p. 187, Pl. 57, figs. 1 and 2,) in its much wider umbilicus and more sharply elevated carina, while in the European species the annulations all reach the umbilicus. In the proportions of the umbilicus it resembles the *A. heliacus* and *A. angulicostatus*, D'Orbigny, (*loc. cit.*, Pl. 25 and 46,) but differs in its sharp dorsal carina, as well as in other characteristics. In external characters this species bears a close resemblance to *A. aalensis*, Zeit. (*A. candicans*), D'Orbigny, (*loc. cit.*, p. 238, Pl. 63,) from the upper Lias.

Locality and Position.—Five miles below the mouth of Vermilion River on the Missouri; in division No. 2 of Section.

HAMITES MORTONI, *n. sp.*PLATE IV. FIG. 3, *a-c.*

Cylindrical, curved, increasing very gradually in diameter towards the larger extremity; surface crossed obliquely by sharp annulations, which are less strong upon the ventral side, and sharper and stronger upon the dorsal side. A few of these annulations are nodose on the back, and some of them also bifurcate and again unite after making half a revolution. Annulations narrower than the space between them. Dorsal lobe shorter than the superior lateral lobe, bifurcate (the two sides a little

dissimilar in details); extremities digitate, the one on the right having two, and that on the left three divisions; sides irregularly sinuous; dorsal saddle as long but not as wide as the dorsal lobe, bipartite at the extremity, the right branch digitate and the left subdivided; superior lateral lobe longer and more diverging than the dorsal lobe or the dorsal saddle, deeply divided into two principal branches, each of which is again subdivided, with numerous shallow, irregular sinuosities along the margin. Lateral saddle very much contracted near the middle, shorter than the dorsal saddle, deeply divided into two branches, which are digitate. Inferior lateral lobe as long as the superior lateral lobe, but narrower, deeply divided into two branches, each of which is again divided, the divisions digitate. Ventral saddle shorter than the lateral saddle, oblique, divided into three lobes at top with smaller ones below. Ventral lobe little more than half as long as the inferior lateral lobe; bifid at the apex, and with three or four small divisions on each side.

This species resembles in its external characters the *H. torquatus* of Morton, (*Synopsis*, Pl. XX. fig. 4,) but the annulations are relatively closer together and less acute than those described by Dr. Morton, and differ in being sometimes distinctly nodose and bifurcating. The fragment possessed by us makes a shorter curve than the figure cited above. In addition to these differences, we may observe that our shell makes a broader or more circular curve than is usual in the species of Hamites, and moreover appears not to curve precisely in the same plane, resembling in this respect the genus *Helioceras* of D'Orbigny, while the septa correspond with those of Hamites.

Locality and Position. — Near Red Cedar Island, thirty-five miles below Fort Pierre, in division No. 4 of Section.

ANCYLOCERAS? NICOLLETTII, *n. sp.*

PLATE IV. FIG. 4.

The fragment in our collection appears to be a part of the outer chamber, including the abrupt curved portion, of a shell of this genus.

Section oval or sub-circular, shell thin, abruptly curved towards the aperture, surface marked by distinct annular costæ, which encircle the shell in a very oblique direction, and become obsolete on the ventral side of the curve, and very irregular in size and distance from each other upon the lateral portions of the shell, often bifurcating once or twice, with sometimes small nodes at the bifurcation, becoming more prominent and equidistant upon the dorsum.

This fossil resembles the fragment figured by Dr. Morton as *Ammonoceratites Conradii*, (*Jour. Acad. Nat. Sci.*, Vol. VIII. p. 212, Pl. X. fig. 1,) but differs from that in curving more abruptly, and could scarcely have formed a circle if continued. It differs also in the bifurcation of the costæ.

It is with some hesitation that we refer this fragment to the genus *Ancyloceras*, but the form of the curvature and character of the annulations more nearly resemble the species of this genus than any other which we know.

Locality and Position. — Great Bend of the Missouri. Division No. 4 of Section.

BACULITES OVATUS and B. COMPRESSUS of Say.

These two species of *Baculites* were first described by Say, and subsequently recognized and redescribed by Dr. Morton, who quotes Say's descriptions, in his Synopsis of the Cretaceous Fossils of New Jersey. The *Baculites ovatus* had also been recognized by the last-named author as occurring in the cretaceous formation in Alabama, as well as in New Jersey and Delaware, showing a wide geographical distribution. The *B. compressus*, regarded by Dr. Morton as a closely allied or perhaps identical species, has been recognized only, so far as we know, in the cretaceous formation of the Upper Missouri, from whence it was first described by Mr. Say.

Dr. D. D. Owen, in his report on Wisconsin, Iowa, and Minnesota, has figured (Pl. VII. fig. 6) a specimen which he refers with doubt to *B. compressus* of Say. The specimen in question is from Sage Creek, Nebraska, and is a fragment apparently of the outer chamber with the shell preserved; and as no septa are shown, it is impossible to determine satisfactorily its relations. On the same plate, fig. 7, another fragment is given, also without septa, and, owing to the bad state of preservation, it shows no characters by which it can be identified with any known species.

The descriptions and figures above cited comprise the amount of our present knowledge of these two species of *Baculites*.

In our collections from Sage Creek, and from various localities along the Missouri River, we have a considerable number of well-preserved specimens of *Baculites*, which by their external characters are readily referred to two distinct species, one presenting in its section a regular ovate form, or sometimes a little flattened on the more obtuse or ventral side, the other presenting a section of very depressed ovate form. These two forms are found to be characterized by internal differences, which are constant in all the specimens examined.

We are inclined to recognize these as the *B. ovatus* and *B. compressus* of Say,

although there are in the details of internal structure slight differences between the ovate forms from the Upper Missouri and authentic specimens of *B. ovatus* from New Jersey.

Inasmuch as the figures and descriptions heretofore published do not fully characterize the species, or enable the student to distinguish these from allied forms, we have endeavored in a manner to supply this deficiency.

BACULITES OVATUS.

PLATE V. FIG. 1, *a-c*. PLATE VI. FIGS. 1-7.

B. ovatus, SAY, Jour. Acad. Nat. Sci. Phil., Vol. VI. Pl. V. figs. 5, 6.

" " " Amer. Jour. Sci., Vol. XVIII. Pl. I. figs. 6, 7, 8.

" " MORTON, Synopsis, 1834, p. 42, Pl. I. figs. 6, 7, 8.

Shell elongated, section ovate, sometimes a little flattened along the ventral side; dorsum marked only by lines of growth, which, passing around, continue obliquely downward for about two thirds of the distance across the side, where they curve gently upwards and pass over the ventrum in a broad arch, thus marking the outline of the aperture. The ventral half of the shell is marked by somewhat regular, transverse undulations, which follow a curve parallel to the lines of growth, dying out entirely or passing into the lines of growth on the dorsal half of the shell, but are sometimes more or less continued upon the ventrum. Aperture (as inferred from lines of growth) having a linguiform extension in front on the dorsum, deeply sinuated at each side on the ventral half, and broadly arched upwards on the ventrum.

Septa symmetrical, lobes in pairs (excepting the ventral lobe), of moderate depth; dorsal lobe wider than high, very little shorter than the lateral superior lobe, divided into two widely separated branches, each of which is tripartite, and the divisions subdigitate. Dorsal saddle as long as, and somewhat wider than, the superior lateral lobe; deeply divided at the top into two nearly equal parts by the accessory lobe, each part is again subdivided into three or four branches with sinuate margins. Superior lateral lobe as long as, but narrower than, the dorsal saddle, deeply divided at the extremity into two parts, and again laterally divided, so that each side presents two principal branches, the terminal ones of which are bifid at the extremities; all with margins sinuate and subdigitate. Lateral saddle same in form as the dorsal saddle, and the details of the ventral side of the one agree with those of the dorsal side of the other respectively. Inferior lateral lobe wider than the superior lateral lobe; similar in its divisions, except that it is more deeply divided at its extremity in the centre, and the

terminal divisions are less distinctly bifid; margins and extremities sinuate and digitate. Ventral saddle as wide as the inferior lateral lobe, two thirds as high as the lateral saddle, and less deeply divided at the top into two unequal parts, the right or dorsal division being again divided into two unequal parts, the lower division of which is somewhat bipartite. Ventral lobe narrow, about half as long as the ventral saddle, digitate at the extremity, and deeply sinuate on the sides. Angle of the apex, as deduced from the convergence of the dorsal and ventral margins by the measurement of several specimens, $3\frac{1}{2}$ to 4° . Longest diameter of largest specimens, 2.8 inches; shortest diameter of same, 1.7 inches. Shell on the ventrum, .13 inch thick; on the dorsum, .1 inch; and on the sides, about .05 inch thick.

In a septate portion of a specimen, the cast gave, in its largest diameter, 1.4 inch; shortest diameter, .9 inch; diameter of siphuncle, .1 inch.

Probable length of largest specimen in this collection, in its perfect state, $3\frac{1}{2}$ feet.

Locality and Position.—Great Bend of the Missouri, and various other localities on that river between Fort Pierre and the mouth of Big Sioux River. Fourth division, ranging through its entire thickness.

BACULITES COMPRESSUS.

PLATE V. FIG. 2, *a, b*. PLATE VI. FIGS. 8, 9.

B. compressus, SAY, Amer. Jour. Sci., Vol. II. p. 41.

" " MORTON, Synopsis, 1834, p. 43, Pl. IX. fig. 1.

" " " Jour. Acad. Nat. Sci. Phil., Vol. VIII. p. 211, 1842.

Shell elongate, extremely compressed, gradually tapering from the base; section very compressed ovate; surface marked by lines of growth, which cross the dorsum, and, bending obliquely downwards, curve outwards till they pass the centre of the side; when they turn more abruptly outwards and again curve upwards, and cross the ventrum in a narrow arch. Lines of growth more prominent on the dorsum, forming faint undulations across the surface. Septa symmetrical; dorsal lobe very wide, and little more than half as long as the dorsal saddle, deeply divided into two widely separated branches, each of which is again divided into two unequal parts, which are sharply and unequally digitate. Dorsal saddle twice as wide as the superior lateral lobe, deeply divided by the acute, sharply digitate auxiliary lobe into two nearly equal parts, each of which is subdivided into three branches, the left or ventral division larger and more irregular than the other; extremities of the branches obtuse. Superior lateral lobe narrow, one third longer than the dorsal lobe, divided into three

branches, the terminal one much the largest and deeply bifurcate, with the divisions smaller than the lateral branches; terminations sharply digitate. Lateral saddle slightly wider and higher than the dorsal saddle, auxiliary lobe longer and dividing it into two parts corresponding in their details to those of the dorsal saddle. Inferior lateral lobe shorter than the superior lateral lobe, and deeply divided into two unequal branches, that on the ventral side being unequally divided into three, and that on the dorsal side into two parts, all sharply digitate. Ventral saddle one third smaller than the lateral saddle, deeply and somewhat obliquely divided, by a sharply digitate, auxiliary lobe, into two nearly equal parts, each again less deeply subdivided and having the terminations all obtuse. Ventral lobe narrow, and of the same length as the auxiliary lobe of the dorsal saddle, sharply digitate, the divisions divaricate.

Angle of the apex (as deduced from measurements of imperfect specimens) about three degrees. The longest diameter of the largest fragment (a septate cast) in our collection is 2.16 inches, and the shortest diameter 1.07 inches; siphuncle of the same individual, .1 inch.

In addition to the external differences already mentioned, we may state that the *B. compressus* is never, in our specimens, marked by the strong undulations which characterize the ventral half of the side of *B. ovatus*. The internal differences are equally striking and characteristic. The dorsal lobe of *B. compressus* is proportionally much wider and less deep, and the two branches much more distant and more divergent than in *B. ovatus*. The central or siphuncular portion of the dorsal lobe in *B. compressus* presents three small auxiliary lobes, the two outer of which are divergent and digitate at their extremities, while outside of these, and between them and the main branches of the dorsal lobe, are one or two subordinate digitations; while in *B. ovatus* the same region is marked by only two short and parallel extensions with a minute point between them, or over the siphuncle, and some undulations on each side.

In *B. compressus* the lobes and auxiliary lobes are all more narrow, longer, and, together with all their subdivisions, much more acute, than those of *B. ovatus*. The superior lateral lobe in the two species likewise presents a striking difference. In *B. compressus* it is divided into three nearly equal branches, the terminal one of which is again deeply bifurcate; while in *B. ovatus* this lobe, in consequence of the greater depth of the terminal sinus, is divided into four nearly equal branches, the two terminal ones being bifurcated by a small sinus. Similar differences are noticed in the inferior lateral lobes of the two species. Another difference may be observed in the relative size of the siphuncles, that of *B. ovatus* being proportionally longer.

Locality and Position.— Sage Creek and Great Bend of Missouri River, etc. Fourth division of Section.

BACULITES GRANDIS, *n. sp.*

PLATE VII. FIG. 1, 2. PLATE VIII. FIG. 1, 2. PLATE VI. FIG. 10.

Shell elongate; section varying from ovate to sub-cordiform; surface of cast marked by very broad and strongly elevated undulations, which commence at the dorsum and pass obliquely downwards, increasing rapidly in size, and, crossing the side of the shell in a broad curve, terminate abruptly on the ventro-lateral region. Undulations less distinct towards the smaller extremity, and finally become obsolete. Septa very deeply lobed, principal divisions scarcely divergent. Dorsal lobe three fourths as long and twice as wide as the superior lateral lobe; terminated on each side by a narrow elongated branch, which is irregularly sinuate and digitate at the extremity. Dorsal saddle shorter and wider than the superior lateral lobe, formed of four branches, the two terminal ones much the larger, and each of them bifid at the extremity by a small sinus; the whole outline more or less sinuous and the extremities digitate. Superior lateral lobe longer by one fifth than the inferior lateral lobe, narrower than the ventral saddle, divided at its extremity by a deep sinus into two equal parts, which are simply digitate; above these are two unequal branches on each side; terminal sinus much deeper than the lateral ones. Ventral saddle longer and about as wide as the dorsal saddle, more deeply divided at its extremity by the auxiliary lobe into two nearly equal branches, each of which is bifid and the extremities digitate, ventral side with three, and dorsal side with two auxiliary branches. Inferior lateral lobe shorter and broader than the superior lateral lobe, divided at its extremity into two nearly equal branches, the one on the dorsal side bifid at the tip and the other digitate, with an auxiliary branch on the ventral side. Ventral lobe as long as the auxiliary lobe of the ventral saddle, but wider at the base, digitate at its extremity.

Angle of the apex about five degrees. Length, as deduced from the measurement of fragments, by the convergence of the dorsal and ventral sides, five and a half feet or more. Longest diameter of a fragment not distorted by pressure, 3.7 inches; shorter diameter from the surface of undulations, 3.3 inches; in the depressions between the undulations, 2.95 inches.

This species is nearly related to *B. ovatus* of Say, from which it differs in its much greater size, larger apical angle, much stronger and more extended undulations, which cross the entire lateral surface of the shell. The section is more obtusely ovate; the

lobes of the septa are much deeper, narrower, and less divergent in their branches; the digitations are sharper and more directly pointed in the longitudinal direction of the shell. The auxiliary lobe of the ventral saddle is longer in this species, while the extremities of the terminal branches are less deeply bifid than in *B. ovatus*. In this species the two terminal branches of the superior lateral lobe are simply digitate, while in *B. ovatus* they are deeply bifid, with obtuse sinuosities. Externally in its undulations on the sides, this species resembles *B. anceps* of Lamarck, but will be readily distinguished by the absence of a dorsal carina, and by its much deeper lobes with less divergent divisions. A comparison of the details of the divisions of the lobes and saddles shows a constant difference in the two species.

Locality and Position. — Mauvaises Terres, head of Bear Creek. Fifth or upper division of the section, and but a few feet below the base of the Titanotherium bed of the Tertiary formation. From this point it is known to extend downwards some twenty or thirty feet, and probably ranges through all the beds of the fifth division.

The occurrence of this fossil at this locality indicates very distinctly the line of demarcation between the Cretaceous and Tertiary formations of this region; and from the absence of other fossils in this division, as far as known, no well-defined line has heretofore been drawn between the deposits of the two periods; and no connection has hitherto been shown between the Eocene formation, containing Mammalian remains, with the Cretaceous formation below.

In examining this collection of specimens, we found no difficulty at the outset in distinguishing the *Baculites ovatus* and *B. compressus* in many large and medium sized shells. At the same time, numerous smaller specimens presented a structure so different, that we were inclined to refer them to distinct species, until a further examination of specimens still more minute satisfied us that they were all to be referred to the one species of *B. ovatus*, showing different degrees of development dependent upon age and growth. A careful examination under a magnifier of a specimen only one twentieth of an inch in diameter, showed the septa, which are so complicated in the mature specimen, to be extremely simple, the lobes and saddles represented by simple undulations. The two extremities of the same specimen also showed different degrees of development, as seen in Plate VI. fig. 1, *a*, and 1, *b*, which are from the smaller and larger extremities respectively of the specimen, fig. 1. An individual of larger growth (about .1 inch diameter) shows a still further advance in the development of the lobes and saddles, with their principal divisions, as shown in fig. 2, 2, *a*. A still further advance is shown in another individual of .16 inch diameter, in fig. 3, 3, *a*, while

fig. 4, 4, *a*, 5, 5, *a*, show an increasing degree of this development as the size of the individual increases. In fig. 6 we have the parts fully developed, as shown in the specimen, Plate V. fig. 1, *a*, and 1, *b*, which is 1.7 inches in its shortest diameter. In all the smaller specimens the section is more broadly ovate, and in the minute ones nearly circular, while the angle of the apex is nearly double that which we have deduced from the measurement of parts of the adult specimens.

We subsequently ascertained that a similar progression in the development of the septa occurs in Ammonites and Scaphites from Nebraska; and in even a more remarkable degree than in the Baculites.*

These facts in relation to Ammonites we have shown in the *A. complexus*, which is represented in two stages of development; while the septa of the inner volutions of the small individual figured are no more undulated than some of the older and more simple forms of Goniatites, leading unavoidably to the conclusion that the animal, in its embryonic and extremely young state, is provided only with simple septa, like the more ancient and recent Nautili.

The *Scaphites nodosus* of Owen, which, in its adult state, has extremely complicated septa, has been proved, by a careful examination, to present in its successive stages of growth the same development as occurs in Baculites and Ammonites, showing that this law of development is common to these three genera; from which we may infer that it may pervade the entire family of Ammonitidæ.

These facts have an important bearing upon the study of this family of fossils, and show in a remarkable degree how beautifully the progression from lower to higher forms of animal organization, as exhibited in the introduction of successive creations upon the same general plan from the older to the more recent geological epochs, is here simulated and illustrated by the phases of development in a single individual in its progress from the young state to maturity.

* We are aware that the same characteristics have been shown in some European species of Ammonites; but these observations were made independently of any hints from other sources; and we are not able to ascertain from any publication within reach, that such features have been discovered in Baculites or Scaphites.

Section of the Members of the Cretaceous Formation as observed on the Missouri River, and thence Westward to the Mauvais Terres.

Eocene Tertiary Formation.	}	Clays, sandstones, etc., etc., containing remains of Mammalia. The entire thickness of this formation in the Bad Lands is from 25 to 250 feet.
Cretaceous Formation.	}	5. { Arenaceous clay passing into argillo-calcareous sandstone. 80 feet.
	}	4. { Plastic clay with calcareous concretions containing numerous fossils. 250 to 350 feet. This is the principal fossiliferous bed of the cretaceous formation upon the Upper Missouri.
	}	3. { Calcareous marl, containing <i>Ostrea congesta</i> , scales of fishes, etc. 100 to 150 feet.
	}	2. { Clay containing few fossils. 80 feet.
	}	1. { Sandstone and clay. 90 feet.
		Buff-colored magnesian limestone of the carboniferous period.

List of Fossils heretofore identified and described from the Cretaceous Formation of Nebraska.

Nautilus Dekayii, Morton.	Solarium flexistriatum, Evans and Shumard.
Ammonites placenta, Dekay.	Pholadomya elegantula, " "
" mandanensis, Morton.	Mytilus galpinianus, " "
" Nicolletii, "	Avicula linguæformis, " "
" Conradii, "	" triangularis, " "
" abyssinius, "	" cretacea, Conrad.
" cheyennensis, Owen.	Ostrea congesta, "
" Nebrascensis, "	" vesicularis, Lamarck (on the authority of M. Nicollet's list).
" lenticularis, "	Inoceramus Barabini, Morton.
" opalus, "	(= I. Crispii? Mantell.)
" moreauensis, "	" sagensis, Owen.
Scaphites nodosus, "	" Nebrascensis, Owen.
" comprimus, "	Cytherea Missouriiana, Morton.
Baculites ovatus, Say.	Tellina occidentalis, "
" compressus, Say.	Cucullea Nebrascensis, Owen.
Belemnites Americanus, Morton.	Anomia tellinoides, Morton.
Rostellaria Nebrascensis, Evans and Shumard.	Hypponix borealis, "

List of Species common to the Cretaceous Formations of Nebraska and New Jersey.

Nautilus Dekayii,	Belemnites Americanus,
Ammonites placenta,	Inoceramus Barabini,
“ Conradii, at Prairie Bluff, Alabama,	Ostrea larva.
Baculites ovatus,	

List of New Species of Fossils described in the Preceding Paper.

Lingula subspatulata,	Natica obliquata,
Caprinella coraloidea,	“ paludinæformis,
Capulus occidentalis,	Actæon concinnus,
Avicula Haydeni,	Buccinum vinculum,
Pecten rigida,	Fusus Shumardi,
Lucina subundata,	“ constrictus,
Cytherea orbiculata,	“ ? tenuilineata,
“ tenuis,	Rostellaria fusiformis,
Crassatella Evansi,	
Pectunculus Siouxensis,	Dentalium gracilis,
Nucula subnasuta,	
“ ventricosa,	Helix Leidyi,
Inoceramus Conradi,	Hamites Mortoni,
“ tenuilineatus,	Ammonites complexus,
“ convexus,	“ percarinatus,
“ sublævis,	Ancyloceras Nicolleti,
“ fragilis,	Baculites grandis,
Natica concinna,	Callianassa Danai.

Among all the collections made in Texas by Dr. Roemer and others, and of all those brought by the Boundary Survey Expedition, and other surveying and exploring parties, which we have seen, there is but a single species which we regard as doubtfully identical with one from Nebraska. This is the *Inoceramus Barabini* of Morton (= *I. Crispii*, Mantell [?]).

The most striking distinction between the fossils of the cretaceous formation of Nebraska, and that of New Jersey and other parts of the United States, is the almost total absence of *Ostrea*, only two small species being known in the Missouri region, while *Exogyra* is quite unknown.

The same region has not hitherto furnished a single Echinoderm in all the collections that have been made there during half a century.

Explanation of Plates.

PLATE I.

FIG. 1, *a*. Fragment of *Callianassa Danai*, natural size.

" 1, *b*. The same, enlarged.

FIG. 2, *a*. *Lingula subspatulata*.

" 2, *b*. A portion of the surface, enlarged.

FIG. 3, *a*. *Caprinella coraloidea*, the external shell partially removed; showing the interior septate portion, with the thick fibrous shell attached on the inner side of the curve.

" 3, *b*. Exterior view of the inner septate portion denuded of the shell, and showing a shallow longitudinal groove from the base to near the apex.

" 3, *c*. Lateral view of the septate interior portion of the shell.

" 3, *d*. Transverse section of the shell at the larger extremity.

" 3, *e*. A portion of the fibrous or tubular part of the shell, enlarged, showing solid prismatic columns, which are marked by parallel divisional planes transverse to the longitudinal axis.

" 3, *f*. A single column still further enlarged, showing striæ parallel to the divisional planes.

FIG. 4, *a*. *Pecten rigida*, natural size.

" 4, *b, c*. The left and right valves, four times magnified.

FIG. 5, *a*. *Avicula Haydeni*, natural size.

" 5, *b*. The same, four times enlarged.

FIG. 6, *a*. *Lucina subundata*, natural size.

" 6, *b*. A portion of the surface, magnified.

FIG. 7. *Cytherea orbiculata*, natural size.

FIG. 8, *a*. *Cytherea tenuis*, natural size.

" 8, *b*. Same, four times magnified.

" 8, *c*. A portion of the surface, still further magnified.

FIG. 9, *a*. *Crassatella Evansi*, exterior or left valve.

" 9, *b*. Interior of same.

" 9, *c*. Surface-markings, enlarged.

" 9, *d*. A cast of same species.

" 9, *e*. Profile view of cast.

FIG. 10, *a, b*. *Nucula subnasuta*.

" 10, *c*. Surface-markings, magnified.

FIG. 11, *a*. *Nucula ventricosa*, natural size.

" 11, *b*. The same, greatly magnified.

" 12. *Pectunculus Siouxiensis*, a cast of the left valve.

- FIG. 13, *a*. *Capulus occidentalis*, cast of interior of convex valve.
 " 13, *b*. Profile view of same.
 " 13, *c*. Base of same.
 " 13, *d*. Surface-markings of the base, magnified.

PLATE II.

- FIG. 1, *a*. *Inoceramus sublævis*, right valve, nearly entire.
 " 1, *b*. A portion of the surface magnified.
- FIG. 2, *a*. *Inoceramus convexus*, left valve.
 " 2, *b*. Profile of same, looking upon the hinge line.
- FIG. 3, *a*. *Inoceramus tenuilineatus*, left valve.
 " 3, *b*. A portion of the surface of the anterior part of the shell, magnified.
- FIG. 4. A portion of the striated surface of the shell of *Inoceramus sagensis*, magnified.
- FIG. 5, *a*. *Inoceramus Conradi*, the exterior portion of the shell of both valves, which are distorted by pressure.
 " 5, *b*. Surface of same, magnified.
- FIG. 6, *a*. *Inoceramus fragilis*, natural size.
 " 6, *b*. Surface of same, magnified.

PLATE III.

- FIG. 1, *a*, *b*. *Natica obliquata*, two views of the same shell.
- FIG. 2, *a*. *Natica concinna*, natural size.
 " 2, *b*, *c*. Two views of the same, magnified.
 " 2, *d*. The surface striæ, magnified.
- FIG. 3, *a*, *b*. *Natica paludinæformis*, two views of individuals of different size.
 " 3, *c*. The surface magnified, showing the cancellated striæ.
- FIG. 4, *a*. *Actæon concinnus*, natural size.
 " 4, *b*, *c*. Same, magnified nine times.
 " 4, *d*. Surface-markings, highly magnified.
- FIG. 5, *a*. *Buccinum vinculum*, natural size.
 " 5, *b*. Magnified view of the same.
- FIG. 6, *a*. *Fusus Shumardi*, natural size.
 " 6, *b*. Magnified view of the opposite side of the same shell.
 " 6, *c*. Surface-markings, magnified.

FIG. 7. *a*, *Fusus constrictus*, natural size.

" 7, *b*, *c*. Magnified views of the same.

" 7, *d*. Magnified views of surface-markings.

FIG. 8. *a*, *b*. *Fusus? tenuilineatus*, two views of a fragment, preserving about two volutions and a half.

" 8, *c*. Surface-markings, highly magnified.

FIG. 9. *a*, *b*. Two views of a fragment of the same, showing the aperture. From the collection of B. F. Shumard.

" 9, *c*. Surface of same, magnified.

FIG. 10. *a*, *b*. *Rostellaria fusiformis*, two views of the same individual.

FIG. 11. *a*. *Dentalium gracilis*, fragments, natural size.

" 11, *b*. Transverse section of the larger extremity.

" 11, *c*. Magnified view of surface.

FIG. 12. *a*, *b*. *Helix Leidyi*, two views of the same individual. From the Eocene Tertiary of the Mauvaises Terres.

PLATE IV.

FIG. 1. *a*. *Ammonites complexus*, a young individual.

" 1, *b*, *c*. Two views of a fragment of a larger shell.

" 2, *d*. Form of the septa, as shown in the young specimen.

FIG. 1. *e*. Superior lateral lobe of the adult specimen.

" 1, *f*. Dorsal lobe of the same individual.

FIG. 2. *a*, *b*, *c*. *Ammonites peracutus*, views of different individuals.

FIG. 3. *a*. *Hamites Mortoni*, a fragment.

" 3, *b*. Section of larger extremity.

" 3, *c*. Arrangement of septa in the same specimen.

FIG. 4. *Ancyloceras Nicolletii*, a fragment.

PLATE V.

FIG. 1. *a*. *Baculites ovatus*, showing the form of aperture, surface striæ, and undulations upon the ventral half of the shell.

" 1, *b*. A fragment, showing septa.

" 1, *c*. Transverse section of the same.

FIG. 2. *a*. *Baculites compressus*, showing the form of the aperture, surface striæ, and arrangement of septa towards the base of the figure.

" 2, *b*. Transverse section of the same.

PLATE VI.

Illustrations of the Septa in Baculites Ovatus, B. Compressus, and B. Grandis.

FIG. 1. *Baculites ovatus*, a fragment of an extremely young individual.

“ 1, *a*. Plan of a septum in the smaller extremity of fig. 1.

“ 1, *b*. A septum at the larger extremity of the same.

FIG. 2. A larger individual of the same species.

“ 2, *a*. Plan of a septum in fig. 2.

FIGS. 3, 4, and 5, are young individuals of larger growth than the preceding, and of which figs. 3, *a*, 4, *a*, and 5, *a*, respectively show plans of the septa.

FIG. 6. Plan of septum in an adult individual of *Baculites ovatus*.

FIG. 7. Superior lateral lobe of *Baculites ovatus*, for comparison with corresponding parts of *B. compressus*, fig. 9, and *B. grandis*, fig. 10.

FIG. 8. Plan of septum in a full-grown individual of *Baculites compressus*.

FIG. 9. Superior lateral lobe of *B. compressus*.

FIG. 10. Superior lateral lobe of *B. grandis*.

PLATE VII.

FIG. 1. *Baculites grandis*, a fragment of the septate portion of the shell.

FIG. 2. Transverse section of *B. grandis*. The inner figure is a section of the smaller extremity of fig. 1. The second figure is of the smaller extremity of Pl. VIII., fig. 1, measured in the depressions between the undulating ridges; and the outer figure is the measurement over the ridges which give a different outline to the section.

FIG. 3 and 4. Tracks of Planarian worms?

PLATE VIII.

FIG. 1. *Baculites grandis*; fragment of the outer chamber, showing the transverse undulating ridges which characterize this species externally.

FIG. 2. Plan of a septum of *B. grandis*.

ADDITIONS AND CORRECTIONS.

SINCE the preceding paper was communicated, we have had an opportunity of examining more extensive collections of specimens from the Nebraska Territory, brought down by Dr. Hayden. Among these are better preserved specimens of several species here described, which enable us to determine their characters with more precision than could be done with our former collections.

Page 391. *FUSUS CONSTRICTUS*. An examination of a larger and better preserved specimen induces us to regard this fossil as belonging to the genus *BUCCINUM*.

Page 393. *DENTALIUM GRACILIS*. Seventh line of description, for "spiral angle" read "apical angle."

Page 394. *HELIX LEIDYI*. The aperture is ovate, subangular behind.

Page 396. *HAMITES MORTONI*. This fossil presents some characters incompatible with the genus *Hamites*, and may be placed under *Ancyloceras*, if we adopt the characters of that genus as given by Pictet. In the same manner the *Ancyloceras? Nicolletii* will be included under the genus *Ancyloceras* as defined by Pictet, but not as limited by D'Orbigny.

Page 401. Last word on the page, for "longer" read "larger."

NOTE.

IN the spring of 1853, the writer of this note was induced to provide the means for a collector to visit and explore some portions of the Mauvaises Terres of Nebraska. He was assured that no government expedition would be sent there that year; and being unable to learn that any private expedition was contemplated, he concluded that the field would be unoccupied, and hoped that some new light might be thrown upon these distant regions, which had but just begun to yield their treasures to the geologist and palæontologist. One of the principal objects of this expedition was the discovery of the fossil flora of this period, so prolific in remains of Mammalia, as well as to determine more clearly the relations between the Cretaceous formations of the Missouri Valley and those of the region especially known as the Mauvaises Terres.

Circumstances which it is not necessary to detail here, and over which the writer or the exploring party had no control, frustrated in a great measure the original objects of the expedition.

The collections made, and facts ascertained, during the short period which the party remained on the ground, have contributed something to our knowledge of the geology of this region; and the preceding new species from the Cretaceous formation of the Northwest are not without interest. These would have been given to the public at an earlier period, but have been postponed at the especial request of other parties having new species from the same region. These have already been made known, and are cited in the list of published species given on page 405; there is, therefore, no longer any reason for delaying the publication of the foregoing species, which, it will be seen, comprise a number equal to all that have before been described from the Cretaceous formation of that country.

XVIII.

Supplement to Memoir XI. of this Volume, on "The Numerical Relation between the Atomic Weights, with some Thoughts on the Classification of the Chemical Elements."

SINCE the printing of the above memoir, the author has altered the details of his classification so far as regards the *metallic elements*, — 1st, by transferring several members of the Four Series to the Three Series; 2d, by subdividing each of these series into groups. The classification as thus altered is presented in the table accompanying the memoir, and conforms to the principle of chemical series more closely than that given in the table originally intended to accompany the memoir, and subsequently published in the American Journal of Science and Arts, Second Series, Vol. XVII. p. 387. The serial relations of the metallic elements may be traced, in the first place, in the groups considered each as a whole, and, in the second place, in the members of any one group by itself. From the limited amount of space assigned to this supplement, it will not be possible to follow out these relations, but they will be suggested to any chemist on inspecting the table. Most of the rarer metals have been omitted in it, not only because their properties are generally very imperfectly known, but also because the table was chiefly intended for teaching elementary chemistry.

J. P. C.

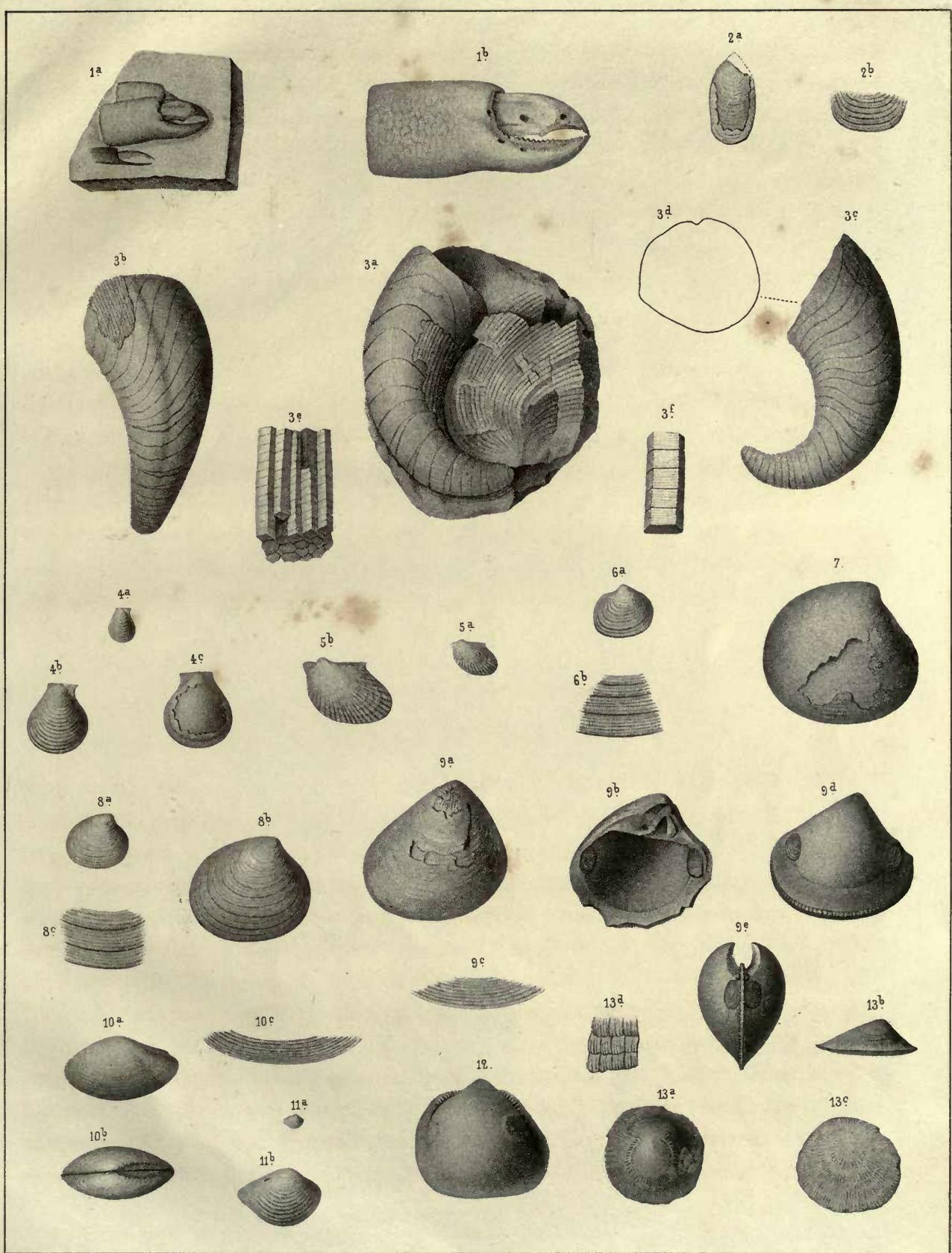
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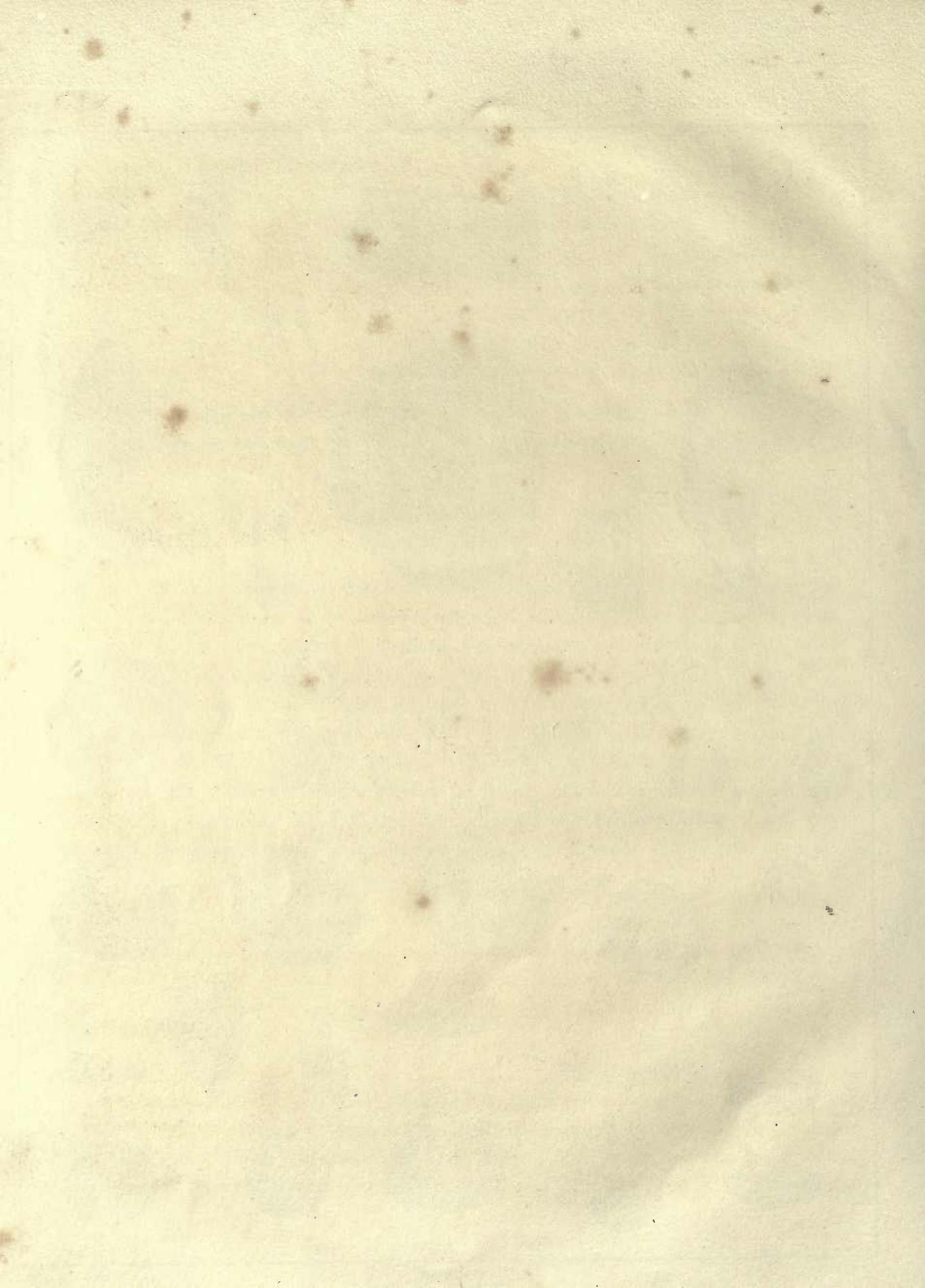
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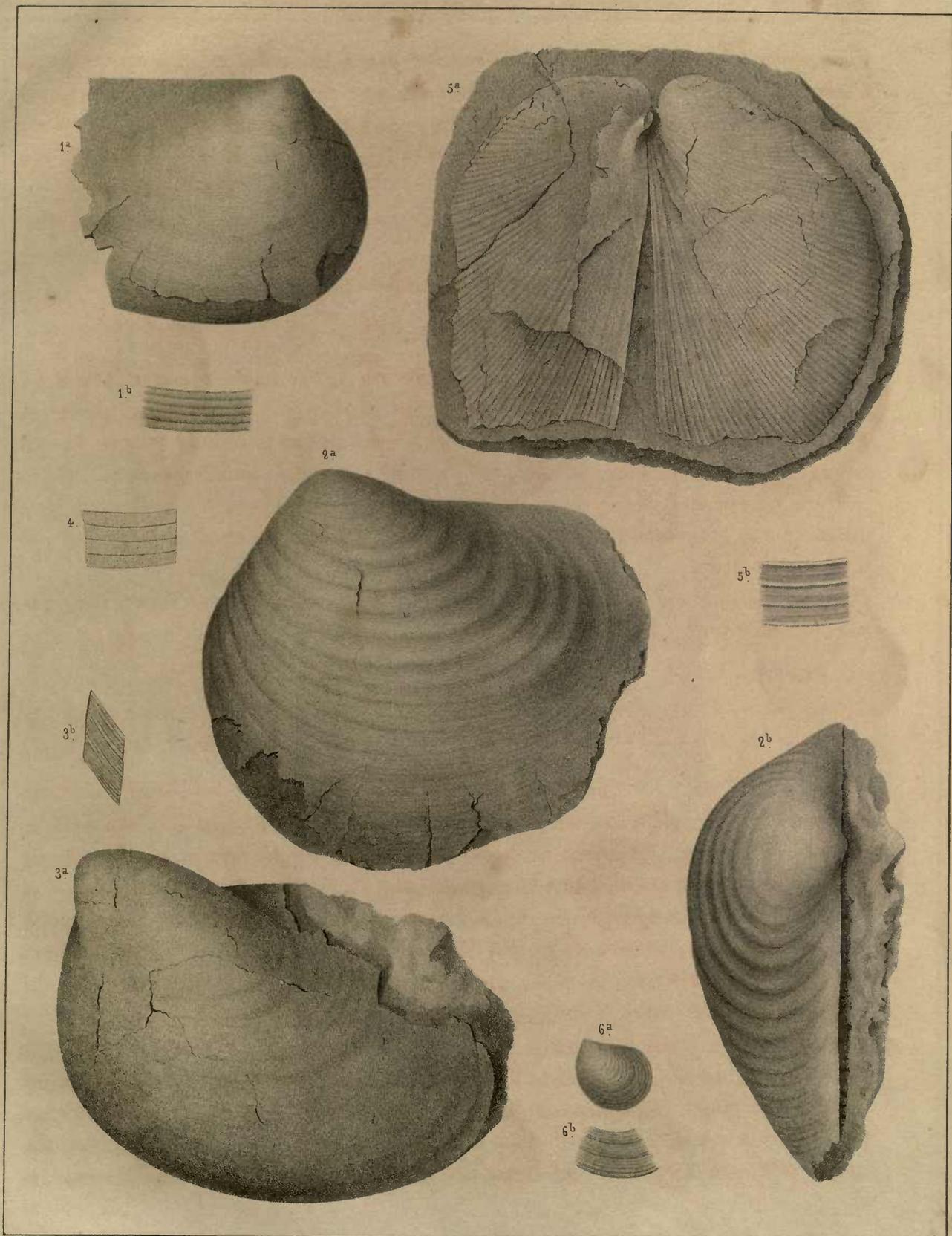
Page 239, line 18, for *mutantis*, read *mutatis*.

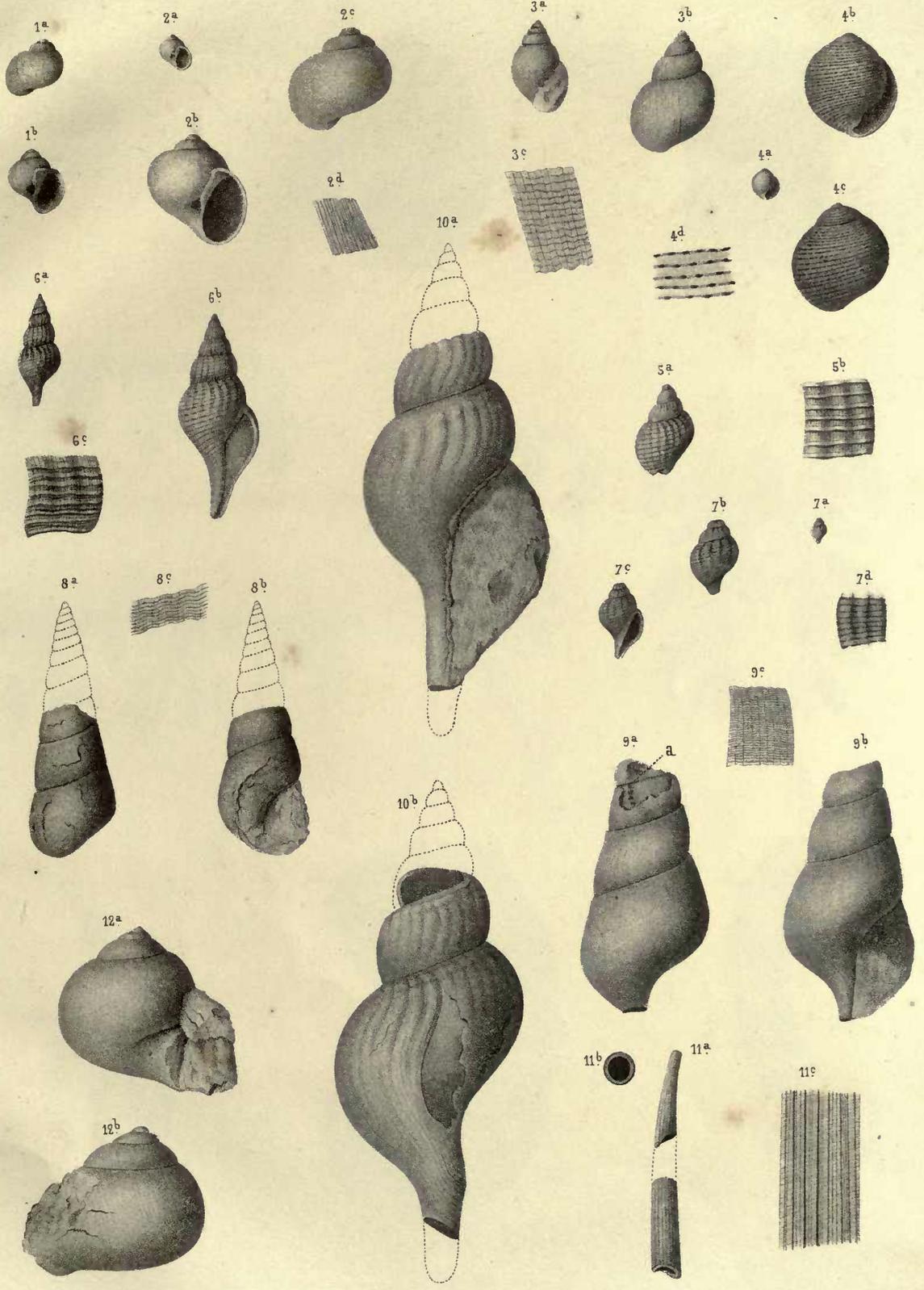
" 241, " 14, " Eight Series, " Nine Series.

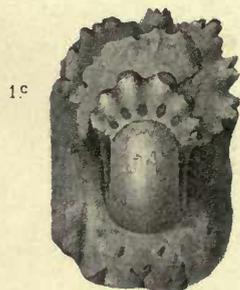
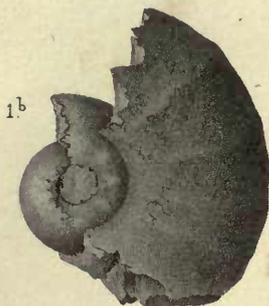
" 256, " 15, " Rhombic, " Hexagonal.



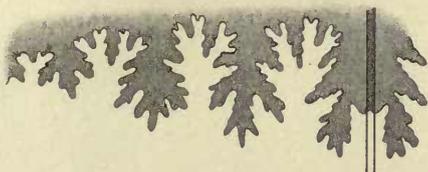








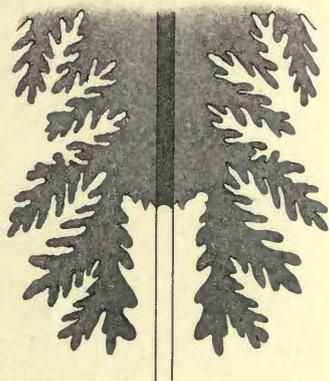
1^d



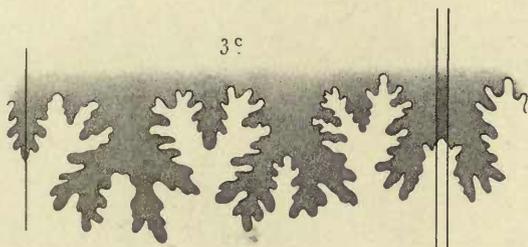
1^e



1^f



3^c



4.

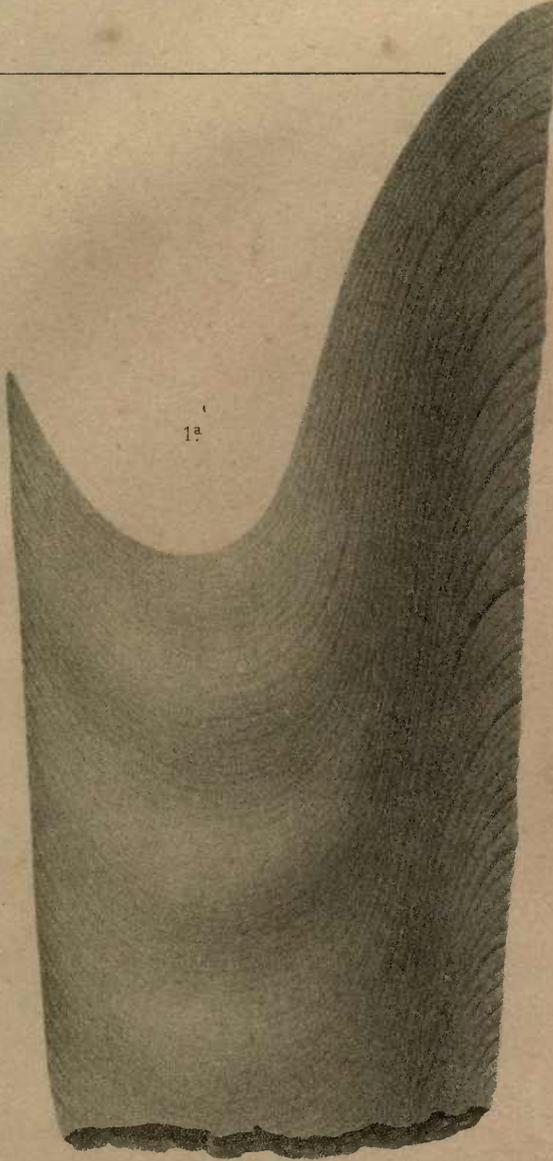


3^a

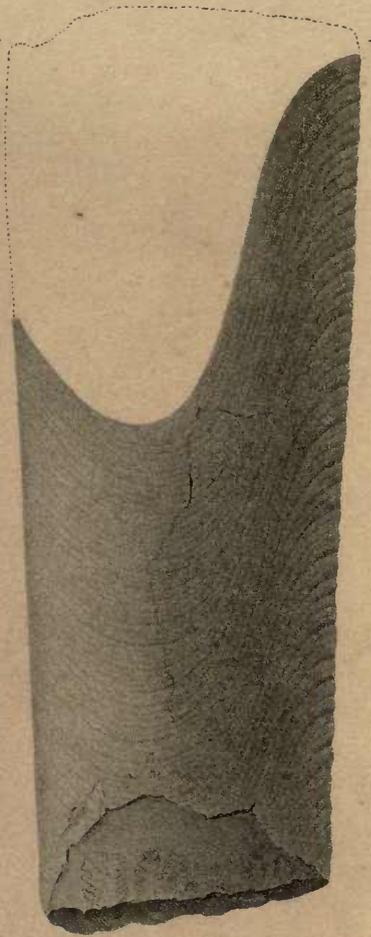


3^b

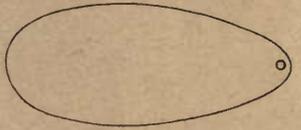




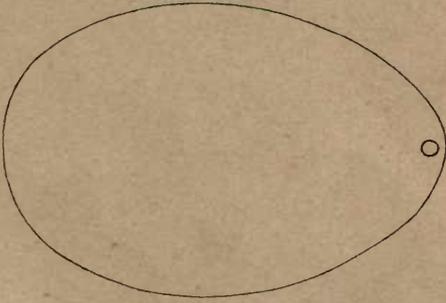
2^a



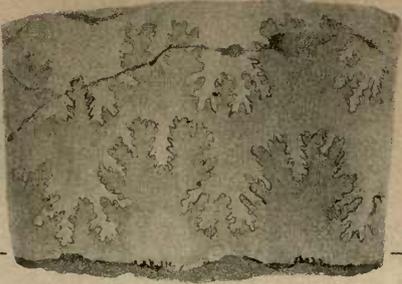
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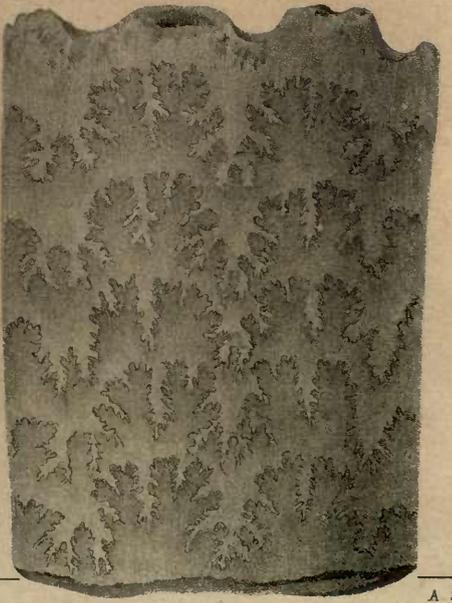
1^c

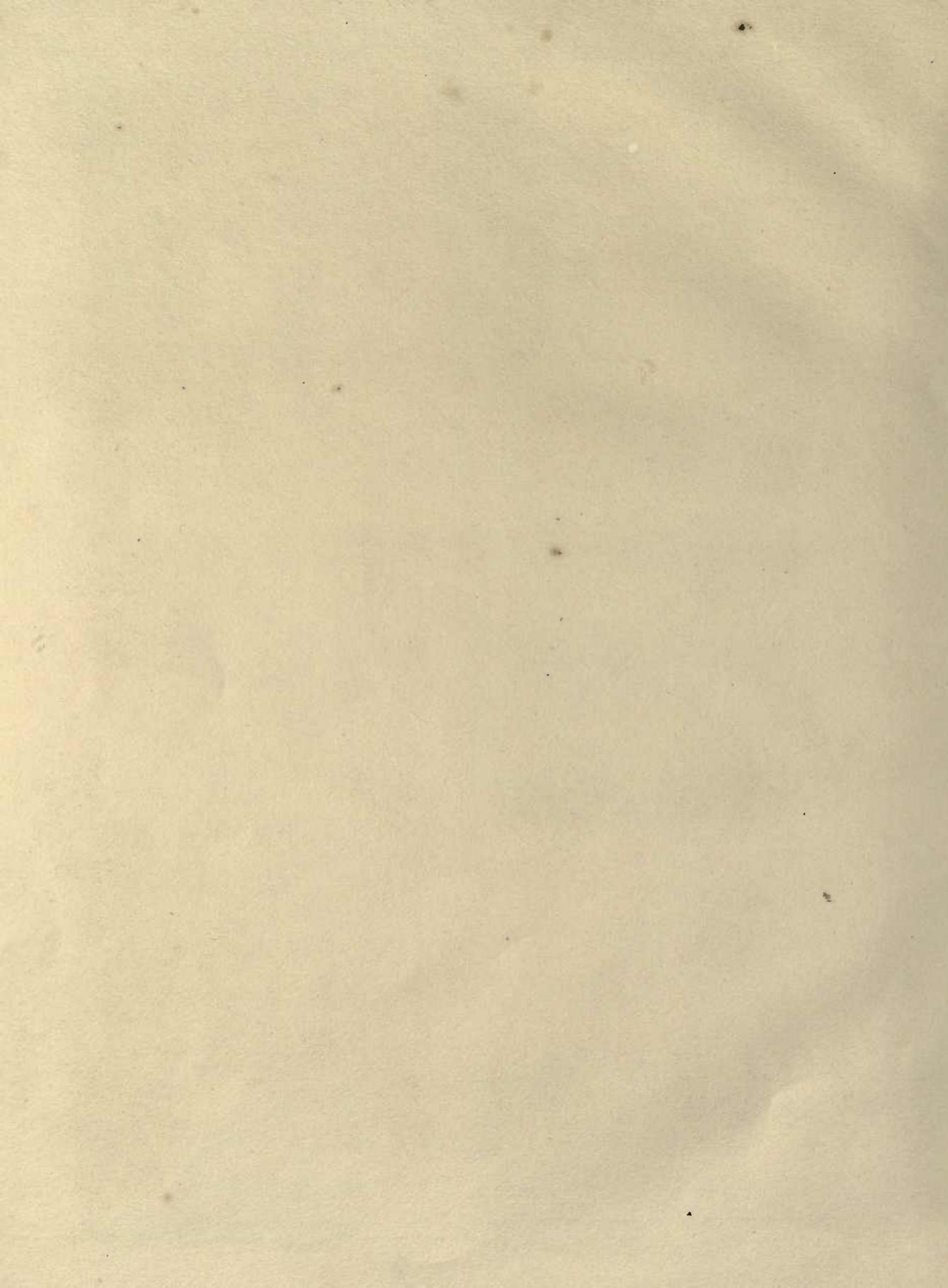


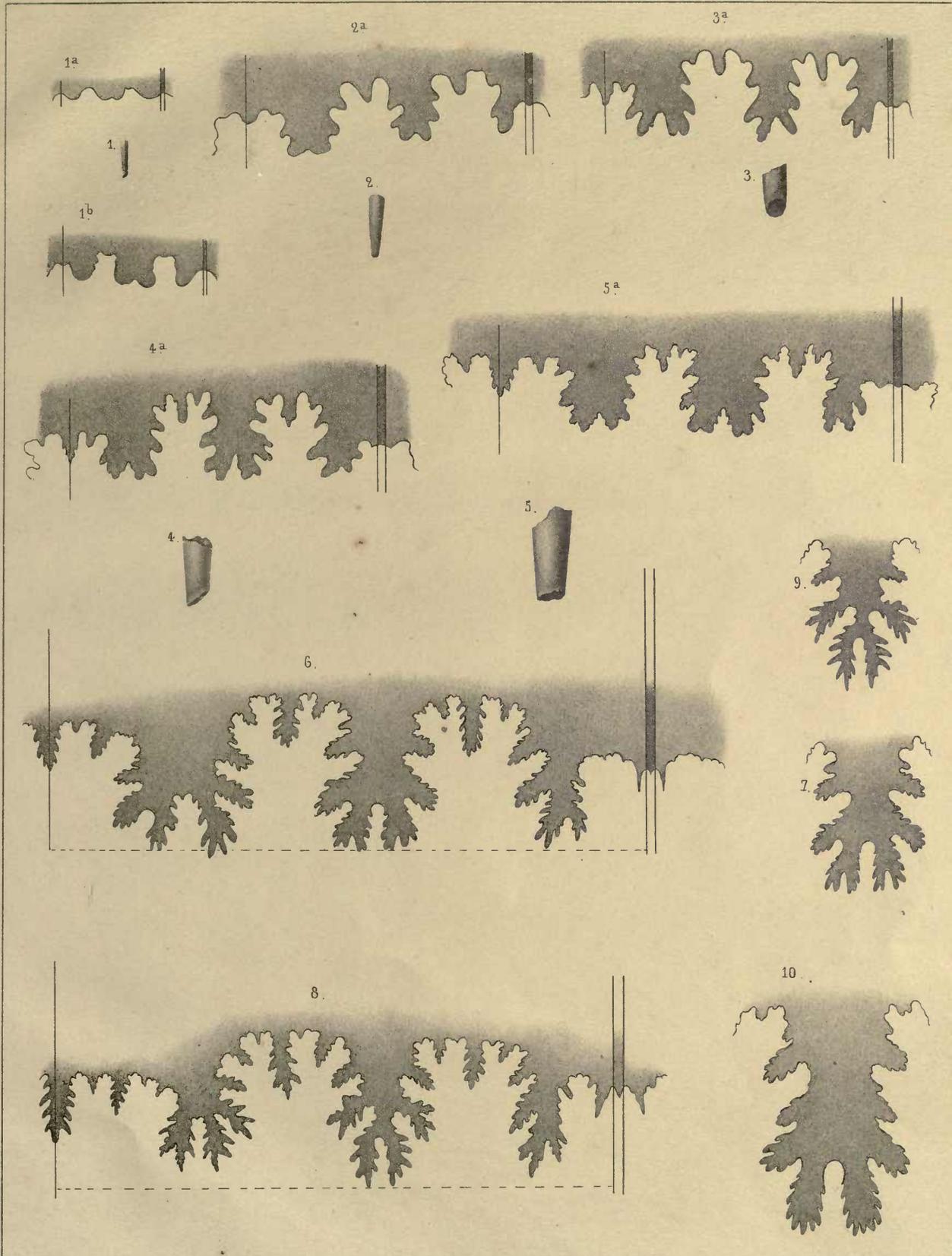
1^b

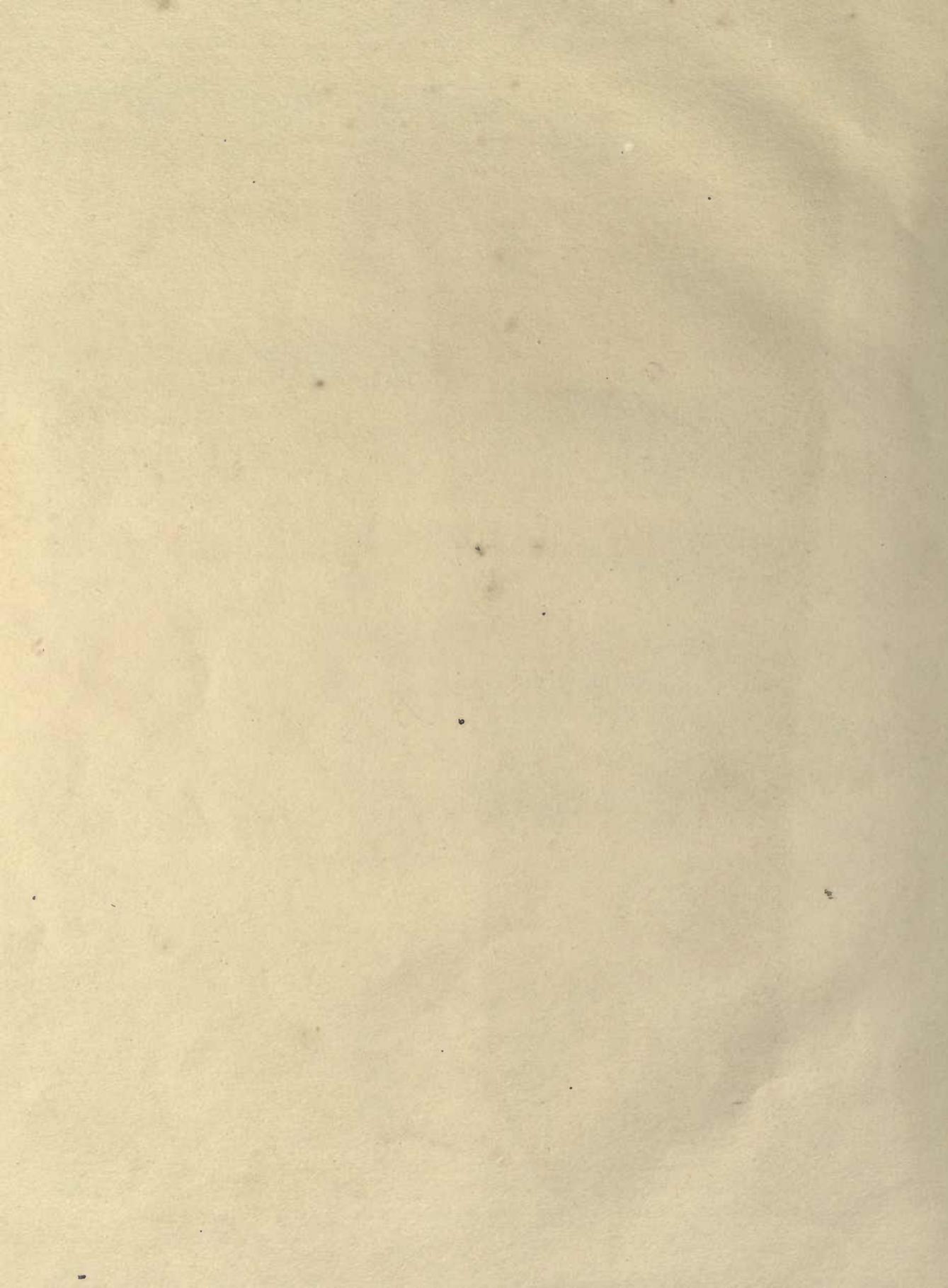


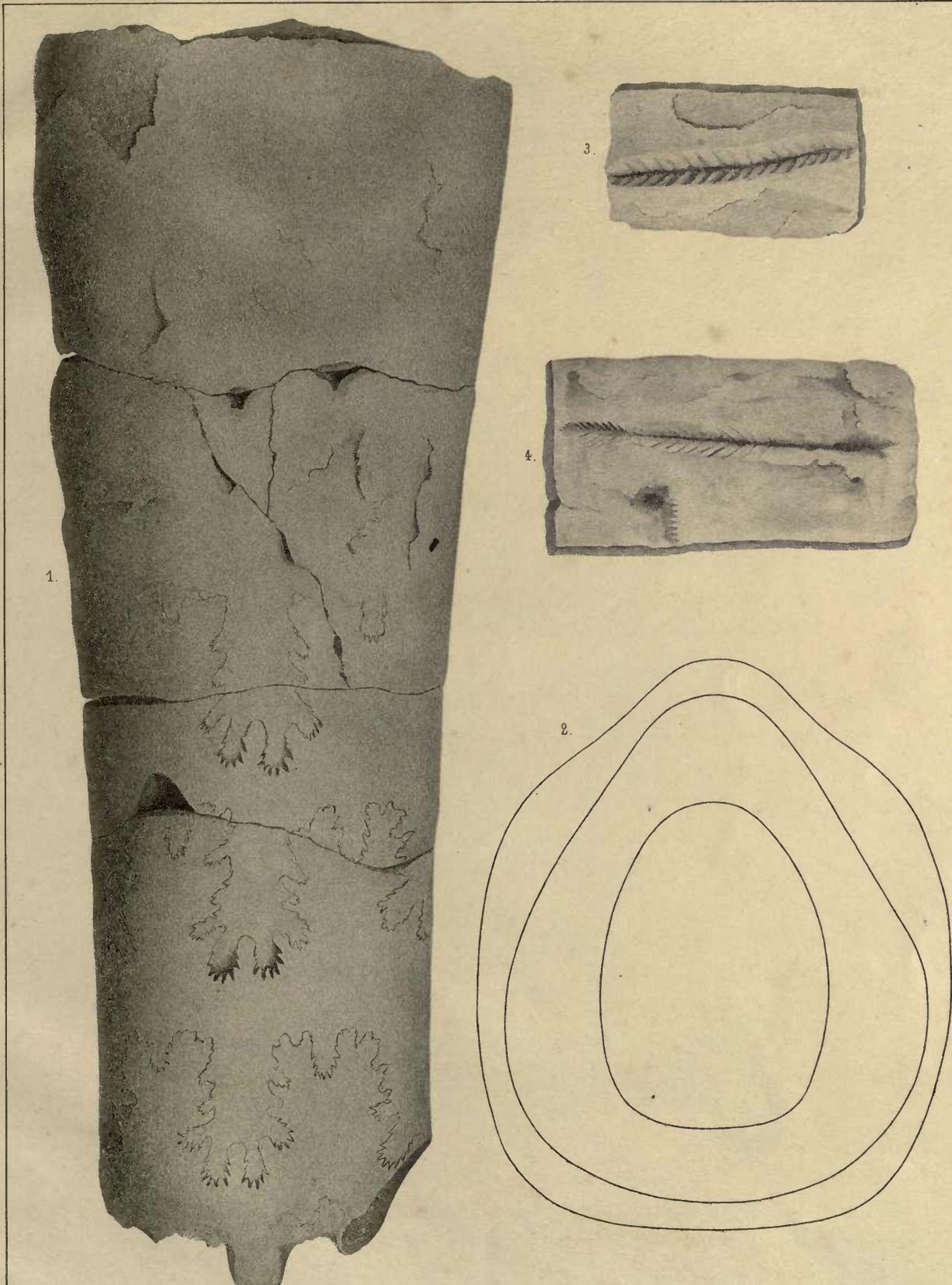
2^b









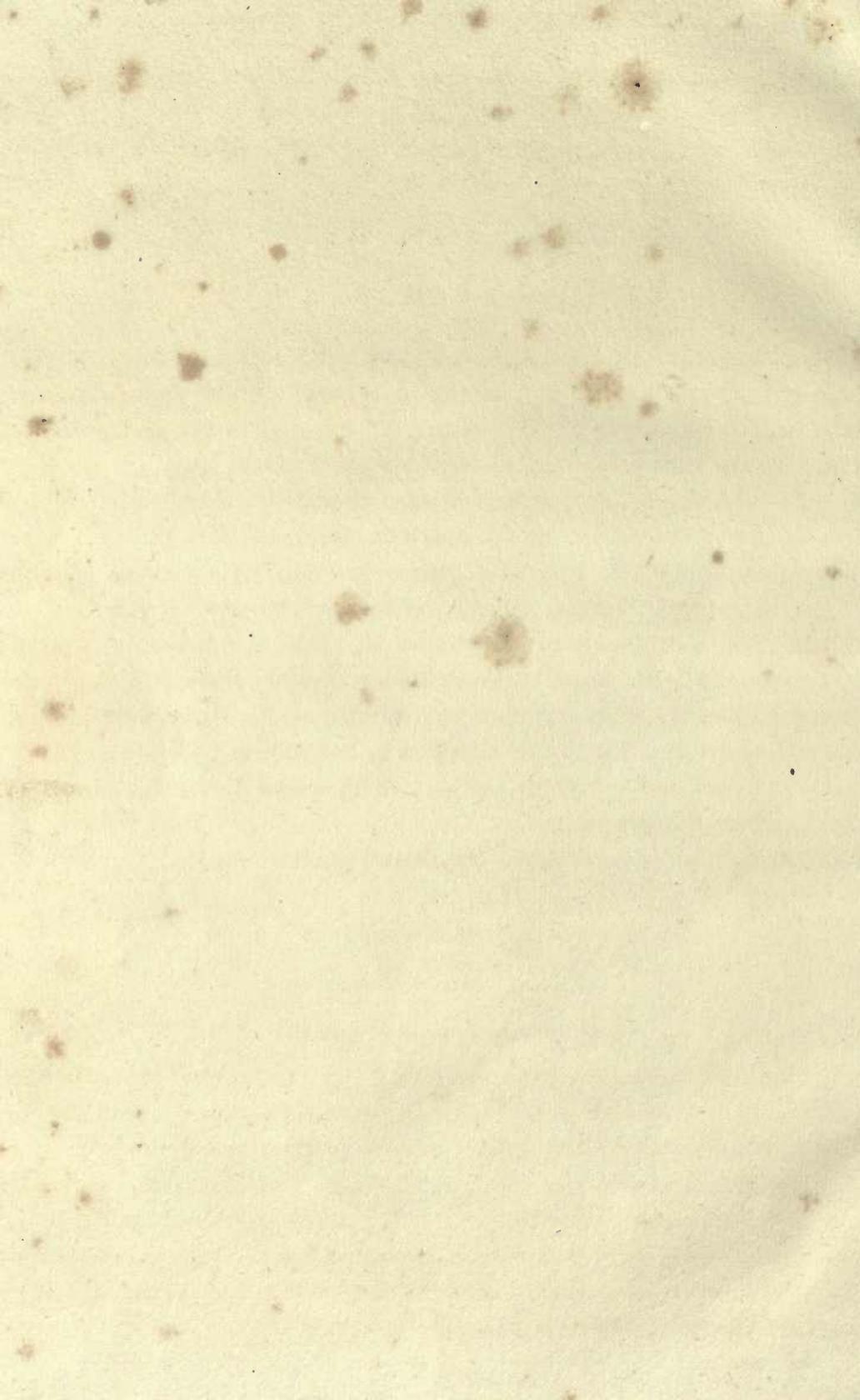


1.

3.

4.

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