

*On Dr. Gerard's collection of fossils from the Spiti valley, in the Asiatic Society's Museum.—By HENRY F. BLANFORD, ESQ. A. B. S. M., F. G. S.*

The paper, of which the following is a revised copy was read before a meeting of the Asiatic Society about eighteen months since, but its publication was fortunately deferred for a time, in order that the illustrations which now accompany it might be completed. In this interval, my friend, Mr. Theobald, returned from a visit to the Spiti valley, and on looking through the fossils which I had described, he communicated to me his conviction that certain of the specimens which I had identified as European Liassic species,\* were not from the Spiti valley at all, but, in all probability, Whitby fossils which had been accidentally mixed up with Dr. Gerard's collection. These specimens had been admitted on the same authority as the majority of the others, viz., the Rev. Mr. Everest's figures in the 18th Volume of the Asiatic Researches, and owing to the neglected state of the collection, and the absence of labels on the majority of the specimens, there had been no means of detecting his error.

The examination of undoubted Whitby fossils, of Col. Strachey's Niti collection and also of M. Jaquemont's collection in the Musée d'Histoire Naturelle at Paris, led me to the same conviction as Mr. Theobald, viz., that the Liassic species were in reality English specimens, and I accordingly wrote a postscript to that effect to be published together with the original paper. Shortly afterwards, however, I returned to India and as the paper had not then been put into type, I considered it better to withdraw and modify it in accordance with the above correction.

A very considerable alteration had indeed become necessary. The collection as originally examined consisted of a fauna in part Triassic, in part Liassic, and partly also Upper Oolitic, some of the species being either identical with species from the Oxford clay or closely allied to forms of that age. The Triassic specimens were not sufficiently numerous to lead me to infer the existence of a distinct formation of that age, and I contemplated the possibility of there being

\* *Ammonites heterophyllus*, Sow. *Ammonites bifrons*, Brug. *Ammonites concavus*, Sow. *Ammonites Thouarsensis*, D'Orb. *Ammonites communis*, Sow. and *Pecten aequalvois*, Sow. Five of these were figured by Mr. Everest in the 18th Volume of the Asiatic Researches, as forming part of Dr. Gerard's collection.

a Liassic formation in the Spiti valley, in which, as in the beds of St. Cassian, certain Triassic forms were intermingled. The Upper Oolitic forms, I regarded (with doubt,) as indicating a distinct formation. The fossils I had examined comprised a majority of Cephalopoda, with a few species of Gasteropoda and Conchifera. The Brachiopoda which formed part of the original collection I had not been able to discover in the Society's Museum.

Mr. Theobald's investigations have now established the existence of Triassic beds as well as those of Silurian and Upper Oolitic age, in the Spiti valley while the now proved spuriousness of the Liassic fossils described, eliminates this fauna from consideration. Further research in the Society's Museum, has yielded me the Brachiopoda of Dr. Gerard's collection and a number of other fossils, which, however, (with the exception of one or two ammonites) want of leisure at present compels me to defer for future examination. The former consist of *Producta*, *Spirifer*, *Terebratula* and *Rhynchonella*, some of them of Carboniferous age, but further than this I am not able to pronounce at present. This paper, therefore, confines itself to a description of the genuine portion of those species included in my original memoir.

I have mentioned that while in England I had the opportunity of examining the valuable collection of Oolitic fossils made by Colonel Strachey at the Niti Pass in Kumaon, as well as those from northern Nepal collected by General Hardwicke, and M. Jaquemont's collection from Spiti. This has rendered an alteration necessary in the names of those species which also occur in the above collections and had already been named by authors or discoverers. This has been effected in the present paper.

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Class. CEPHALOPODA.

Order. DIBRANCHIATA.

1. BELEMNITES SULCATUS, Miller. Plate I. figs. 1, 2a-c.

This Belemnite is apparently identical with that occurring in the Oolitic rocks of Cutch, which has been described and figured by Mr. Sowerby, (Geol. Trans. 2<sup>nd</sup> Ser. Vol. V.) as *B. canaliculatus*, Schlotheim.

The Spiti specimens differ from those figured by Miller and D'Orbigny, in the guard being more compressed in form, so that the

dorso-ventral diameter is rather the longer. The angle of the phragmacone is about  $17^\circ$ , while that given by M. D'Orbigny is  $18^\circ$  to  $18\frac{1}{2}^\circ$ . These differences, however, do not appear to me to warrant specific distinction.

There are several phragmacones of this species in Dr. Gerard's collection. The largest is 2 inches in diameter. The largest guard measures as follows:—

- 8 in 10 lines long.  
 —  $10\frac{1}{2}$  „ lat. diam.  
 —  $10\frac{1}{2}$  „ ant. post. diam.

Order. TETRABRANCHIATA.

2. AMMONITES ACUCINCTUS, Strachey, Plate I. figs. 3, 3a.

*A. testâ discoideâ, percompressâ, complanatâ, subœvigatâ, obsolete flexuoso-costatâ. Anfractibus complanatis, amplexantibus. Ventre sub-acuto; juniore dentato. Umbilico parvo; marginibus rotundatis. Aperturâ angustè hastatâ. Lobo superiori septorum longiori.*

Diameter of shell	1 inch 8 lines	}	A fragment wanting the body whorl.
„ of outer whorl	11 „		
Thickness	4 „		

With of outer whorl =  $\frac{5.5}{10.8}$  of the diameter of the shell.

Nearly allied to several Liassic species, viz., *A. oxynotus*, Quenstedt, *A. lynx*, D'Orbigny, and *A. Coynarti*, D'Orbigny, this Ammonite is readily distinguished by the peculiar palmate form of the saddles, and the length of the superior lateral lobe as compared with the ventral [*quasi dorsal*] lobe. The denticulation of the keel is, as in *A. lynx*, only apparent on the young shell, and becomes obsolete with age. The sides are faintly marked with ribs curved like those of *A. concavus*. Dr. Gerard's collection contains two specimens of this species.

3. AMMONITES STRIGILIS,\* n. s. Pl. III. figs. 1, 1a.

*A. testâ discoideâ, costatâ, compressè tuberculatâ. Anfractibus amplexantibus, quadratis. Costis simplicibus, compressis, prominentibus, anticè inclinatis; apud venter, valdè angulatis. Ventre*

\* There is some doubt whether this specimen be really from Spiti, though there is I think but little question that it comes from the north Himalayan formation. It is one-half of a cut specimen. Another half specimen, (possibly the fellow of the above,) is in the British Museum, its locality being also unknown.

planato, costato. Umbilico angusto; lateribus leniter inclinatis, rotundatis.

Diameter of shell 2 inches 1 line.

„ of outer whorl 1 „ 2 „

Thickness 11 „

Width of outer whorl =  $\frac{5}{100}$  of the diameter of the shell.

A peculiar form, combining the characters of the *Globosi* and *Amalthei* groups. The young shell is smooth, (in the single specimen described, to beyond the commencement of the body chamber,) and the last half whorl ornamented with strong, simple compressed ribs, inclined forwards from the umbilicus, and becoming more elevated as they approach the ventral region, on the sides of which, they rise almost into tubercles; then becoming less prominent as they bend forward on each side of the median line, they form an angle in the centre, being again elevated at the bend into a series of flattened tubercles. The whorls are rounded in the young, squared in the old shell. The sutures are very imperfectly seen: the saddles appear to be squared in form, and symmetrically divided, and the superior lateral lobe is probably longer than the ventral as in the *Globosi*.

4. AMMONITES WALLICHII, Gray, Plate I. figs. 4, 4a, Plate III. figs. 2, 3.

A. testâ discoideâ, compressâ, transversim costatâ. Anfractibus subcompressis, complanatis. Ventre angusto, excavato, levigato. Costis acutis, bifurcatis, haud tuberculatis. Umbilico lato, profundo. Aperturâ oblongo-quadratâ. Septis, lateraliter 5-lobatis.

Diameter of shell 1 inch 9 lines.

„ of outer whorl  $7\frac{1}{2}$  „

Thickness 7 „

Width of outer whorl =  $\frac{25}{100}$  of the diameter of the shell.

This ammonite, of which there are two specimens in the collection, is allied to *A. Parkinsoni*, Sowerby. The chief points of departure from the latter species are;—the absence of tubercles; the greater width of its whorls ( $\frac{25}{100}$  instead of  $\frac{27}{100}$  of the diameter); and some differences in the sutural lobes, the superior lateral being barely so long as the ventral lobe, and having fewer ramifications than that of *A. Parkinsoni*. The two specimens before me differ somewhat

in the characters of the ribbing of the outer whorl, those of the inner whorls being exactly similar: the specimens are of the same diameter, but while that figured at Plate I. fig. 4, appears to be full grown,\* that figured at Plate III. fig. 2, is only a fragment, wanting the body chamber, and the body-whorl of the former specimen, as is the case with many Ammonites and Nautili, is thicker than the inner whorls in proportion to their diameter, and exhibits a coarser and wider ribbing, the ribs being rather inclined backwards. *A. fissus*. Sow, from the Oolites of Cutch, bears a general resemblance to the present species, but it appears from the description to have the ribs continuous across the back.

5. AMMONITES OCTAGONUS, Strachey, Plate I. figs. 5a—c.

*A. testâ discoideâ, compressâ. Anfr. parum amplexantibus, rotundatis, lateraliter seriebus 3 tuberculis magnis ornatis, irregulariter costatis. Aperturâ ellipticâ. Septis lateraliter 3-lobatis.*

Allied to *Ammonites Eugenioi* of Raspail, to which species I referred it in the first instance. It is ornamented with three rows of prominent tubercles connected by depressed and somewhat irregular ribs.

Only one fragment of this Ammonite is in Dr. Gerard's collection, viz., that figured. It does not allow of my determining the spiral proportions.

6. AMMONITES NEPALENSIS, Gray, Plate I. figs. 6, 6a.

*A. Nepalensis.* Gray, Hardwicke's Illustrations.

*A. testâ discoideâ, compressâ, complanatâ, costatâ; anfractibus perlatiis. Costis filiformibus bi-vel tri-furcatis. Ventre rotundato. Umbilico angusto. Aperturâ compressè ellipticâ. Septis ?*

Diameter of shell 1 inch 5 lines.

„ of outer whorl 9 „

Thickness 6½ „

Width of outer whorl =  $\frac{9}{10}$  of the diameter of the shell.

An Ammonite of the Macrocephali type, but more compressed, ornamented with distinct filiform ribs, bifurcating or trifurcating about the middle of the whorl, and arched forwards in the ventral region. The sutures are not visible. A single specimen occurs in Dr. Gerard's collection. It is much smaller than Dr. Gray's type, and has a somewhat narrower umbilicus. Some large specimens were, however, collected by Mr. Theobald.

\* If so, however, the specimen is a small one, as one in Col. Strachey's collection is nearly 4 inches in diameter and one in the British Museum not less than 6 inches.

7. *AMMONITES TENUISTRIATUS*, Gray.

*A. tenuistriatus*, Gray, Hardwicke's illustrations.

A single cast containing a portion of the body whorl in which is a beautiful cast of an *Aptychus*, is to be referred doubtfully to the above species. The curvature of the ribs is similar to that of the type, but the whorls are narrower and rather thicker. Judging from the few specimens I have seen, *A. tenuistriatus* appears, however, to be very variable in this respect, and I refer the Spiti specimen therefore provisionally to this species.

8. *AMMONITES BIPLEX*, Sowerby, Plate II. fig. 5, Plate III. figs. 4, 4a—c, 5.

*Ammonites*. Everest. *As. Res.* Vol. XVIII. Pt. II. p. 114, Pl. I. figs 2, 3.

*A. annulatus*. Sowerby. *Op. et. vol. cit.* p. 278.

Several specimens of an Ammonite, which I cannot distinguish from the well known Oolitic species above quoted, occur in the collection, in black siliceous nodules. One large specimen measures 5 inches and 2 lines in diameter. Others less perfect, from 3 to 3½ inches. The width of the outer whorl varies from  $\frac{3\frac{3}{8}}{10\frac{0}{8}}$  to  $\frac{3\frac{7}{8}}{10\frac{0}{8}}$  in the more typical specimens, and the aperture is almost orbicular, slightly flattened at the sides. The ribs are sharp and numerous, and bifurcate very regularly at about  $\frac{1}{3}$  across the whorl. Most of them have an occasional deep sulcation, indicating the position of a previous mouth. The sutures correspond closely to that figured by M. D'Orbigny in the *Pal. Française*.

In addition to the above, two specimens, which at first I hesitated to regard as the same species, have the ribs much more numerous, and the whorls wider; the outer whorl being  $\frac{3\frac{3}{8}}{10\frac{0}{8}}$  and  $\frac{4\frac{1}{8}}{10\frac{0}{8}}$  respectively, of the diameter. That with the latter measurement is moreover more compressed than the typical specimens, the thickness being  $\frac{3\frac{7}{8}}{10\frac{0}{8}}$  only. On consideration, however, I can see no good reason for regarding these specimens as specifically distinct from the more typical. Their sutures are very similar, and as regards form, the narrower whorled of the two differs but little from the type, while the peculiar close set ribbing distinctly indicates the specific identity of the two. One of these is figured at Plate III. figs. 4, 4a.

An important point to be noticed in comparing full grown speci-

mens of this species, and indeed of many of the *Planulati* and some other Ammonites, is that the last two or three sutures are frequently closer than the preceding, and are more or less shortened and distorted. In order, therefore, to establish a reliable comparison, and to avoid erroneous specific distinctions, one of the older sutures should be regarded as the standard. I give an illustration of this in figs. 4b and 4c of Plate III. the first of which represents the last suture of the whorl, (that terminating the body chamber,) the second, the sixth suture of the same specimen, counted backwards. I have observed similar irregularities in *A. inflatus*, and many Nautili (e. g. *N. Boucardianus*), have the last one or two chambers considerably narrower than those formed during earlier growth.

Fig. 5, Plate III. is the last suture of a specimen of the normal variety of *A. biplex*, which I give as it is the only one visible on any of my specimens.

#### 9. AMMONITES TRIPLICATUS, Sowerby.

Two specimens differ from the preceding in having the ribs, especially those of the last whorl, trifurcate. I have seen specimens both from Niti and Spiti with fasciate ribs, but otherwise undistinguishable from *A. biplex*. I am inclined to doubt whether they be other than varieties of that species.

#### 10. AMMONITES TORQUATUS, Sow. ? Pl. III. figs. 6, 6a, 7, 7a, 8.

*A. testâ, discoideâ, compressâ, costatâ, latè umbilicatâ. Anfractibus rotundatis, depressis, convolutis. Costis filiformibus, rectis, anticè inclinatis, apud  $\frac{2}{3}$  anfractuum diametris bifurcatis. Ventre latè rotundato, costato. Aperturâ reniformi. Septorum lobis lateralibus 4.*

	a	b
Diameter of shell,	1 inch 6 lines.	
"    of outer whorl,	5   "	9 lines.
Thickness	7 $\frac{1}{2}$ "	1 inch 1 $\frac{1}{2}$ "

Width of outer whorl =  $\frac{2}{100}$  to  $\frac{3}{100}$  of the diameter of the shell.

This shell is distinguished from *A. biplex* chiefly by its depressed whorls, and also by the greater width and comparative shortness of the saddles and lobes. The ornamentation of the shell is precisely that of *A. biplex*, and it is indeed possible that *A. torquatus* may be merely a variety of that species, but until specimens of intermediate form, &c., have been discovered, the distinctions I have indicated are too considerable to be disregarded.

11. *AMMONITES SPITIENSIS*, n. s., Plate II. figs. 4, 4a, 4b.

Diameter of shell, 2 inches 3 lines.

" of outer whorl, 9 "

Thickness, 11 "

Width of outer whorl =  $\frac{2}{100}$  of the diameter of the shell.

This Ammonite bears some resemblance to the *A. planula* of D'Orbigny, but is distinguished by the following characters—the whorls of the Spiti species are somewhat narrower, the ribs more flexuous, and arcuated towards the front instead of towards the rear in the ventral area, and the shell is crossed at intervals of rather more than half a whorl, by deep oblique sulcations bounded posteriorly by strong ribs. The sutures are identical with those of the *A. planula*, except that the ventral and superior lateral lobes of the Spiti fossil are equal in length, and it has but two minute accessory lobes, instead of 3, as figured by M. D'Orbigny.

12. *AMMONITES GUTTATUS*, Strachey, Plate IV. figs. 1, 1a, 1b.

*A. testâ discoideâ, compressâ. Anfractibus rotundatis, apud umbilicum crassioribus, tuberculato-costatis, 3 sulcis obliquis notatis. Costis numerosis, tenuibus, apud umbilicum 3, 4-fasciatis, apud ventrem, leniter anticè arcuatis. Ventre rotundato. Umbilico profundo, lato, tuberculis 20 coronato. Aperturâ semiunari? Septorum lobis lateralibus 6.*

Diameter of shell, 2 inches 1 line.

" of outer whorl, 9 $\frac{1}{4}$  "

Thickness, 11 "

Width of outer whorl =  $\frac{2}{100}$  of the diameter of the shell.

Very closely allied to the preceding species, from which it is distinguished chiefly by the characters of its sutures; the lobes and saddles being  $\frac{1}{2}$  longer, and the saddles narrower than in *A. Spitiensis*; while there are 4 conspicuous and 2 minute lateral lobes instead of 3 of the former, as in the above species. There are also some differences in the ornamentation, but how far these are constant I am unable to say. Thus, in *A. Spitiensis*, the ribs and tubercles are less numerous than in *A. guttatus*, and the sulci of growth are three to each whorl, and continuous in the former species, while in the latter there are barely 2 to the whorl. These latter differences I consider, however, to be unimportant, and should further specimens shew the sutures to be more variable than is usual



in Ammonites of the same group, there would remain no good reason for distinguishing the two forms in question.

13. AMMONITES HYPHASIS, n. s. Plate IV. figs. 2, 2a, 2b.

*A. testâ* discoideâ, compressâ, costatâ. Anfractibus subquadratis, parum amplexantibus. Costis valdis, rectis; nonnullis (plerumque alternantibus) bifurcatis; medio ventre parum incis, haud interruptis. Ventre planato. Umbilico magno: suturis impressis. Apertura reniformi. Septorum lobis lateralibus 4.

Diameter of shell,	1 inch 10 lines.
„ of outer whorl,	7 „
Thickness,	8 „

Width of outer whorl =  $\frac{2}{100}$  of the diameter of the shell.

Intermediate in form between *A. communis*, and *A. Parkinsoni*, this shell is distinguished from the first by the mesial notching of the ribs which indicates an approach to the *Dentati*, (*Ornati* of Von Buch); and from the second by its continuous ribs, as well as by the inferior number of its lobes and their greater equality in size. Some of the ribs carry a small tubercle at the bifurcation, which occurs alternately on the opposite sides of the whorl. The collection contains two small specimens of this Ammonite, which are precisely similar to each other, and a fragment of a larger specimen  $1\frac{1}{2}$  inches in thickness.

14. AMMONITES GERARDI, n. s. Plate II. figs. 6, 6a, 6b.

*A. testâ* subglobosâ, levigatâ, angustè umbilicatâ. Anfractibus ventraliter subcompressis, amplexantibus; senioribus, radiatim latè undulatis. Ventre rotundato. Umbilico parvo, profundo. Apertura trigonâ, apud dorsum valde excavatâ.

	<i>a</i>	<i>b</i>
Diameter of shell	2 inches.	$3\frac{1}{4}$ inches.
„ of outer whorl	1 inch.	$1\frac{1}{2}$ „
Thickness	1 „ 2 lines.	$1\frac{1}{2}$ „

Width of outer whorl =  $\frac{2}{100}$  of the diameter of the shell.

This Ammonite belongs to a group largely represented in the Triassic beds of St. Cassian, and of which one species only, *A. sternalis*, Von Buch, is described by M. D'Orbigny, Quensted and others from the Upper Lias of France and Germany.\* To this species, *A. Gerardi* bears much external resemblance, but the sutural ramifications of the Spiti fossil prove it to be without doubt a distinct spe-

\* Several species occur in the Cretaceous rocks of S. India.

cies. Moreover, from such fragments of shell as remain on one of our specimens, it appears that this was smooth in *A. Gerardi* as in the Triassic forms, whereas that of *A. sternalis* is ornamented externally with fine ribs.

The ventral lobe of the septa of *A. Gerardi* is extremely short, barely half as long as the superior lateral lobe, and is divided almost its entire length. The lateral lobes are nearly equal and fan-shaped at the extremity, and the saddles simple and compressed in form.

Four specimens are in the Gerard collection; one of the smaller, a distorted specimen, was figured in the Asiatic Researches; another is here represented. These are both young and do not shew the radiate undulations which characterize the adult shell.\*

15. CERATITES? HIMALAYANUS, n. s. Plate II. figs. 7, 7a.

*C. testâ discoideâ, compressâ, carinatâ, tuberculato-costatâ. Anfractibus amplexantibus, complanatis. Tuberculis internis apud  $\frac{1}{3}$  anfractuum 10: externis apud peripheriam 20. Costis haud prominentibus, inæqualibus, plerumque bi vel tri-furcatis. Ventre anguste carinato, haud sulcato. Umbilico parvo; marginibus rotundatis. Aperturâ angulatè ovatâ, anticè complanatâ.*

Diameter of shell, 1 inch 6 lines.

„ of outer whorl 9 „

Thickness, 7 „

Width of outer whorl =  $\frac{5}{108}$  of the diameter of the shell.

The specimen of this shell in the Spiti collection, although in a very fair state of preservation, does not present so clean a surface on that part on which alone the sutures are visible, as could be desired for the satisfactory determination of the genus. There is, however, no trace of any foliation on the saddles, so far as they can be seen, while the lobes of one part are distinctly dentated like those of the typical *Ceratites*. It is clearly distinct from *C. Jaquemonti*, Von Buch, the only known Himalayan species of the genus, which according to its discoverer, whose name it bears, was found associated with *Ammonites biplex*, and a number of other Oolitic forms of *Ammonites*.

In form and ornamentation, *C. Himalayanus*, is closely allied to *C. Nodosus*, the type of the genus, but differs in its narrower ventral region and keeled periphery.

\* The largest specimens were only discovered after the plates had been finished.

## Class. GASTEROPODA.

16. *TURRITELLA MONTIUM*, n. s. Plate I. fig. 7.

*Turritella?* As. Res. Vol. XVIII. Part 2, p. 114, Pl. I. fig. 12.

S. testâ crassâ, conicâ, turritâ. Spirâ brevi, angulo 28°. Anfractibus angulatis, medio valdè bicarinatis, supernè obliquis, planatis: ultimo ad basin depressè rotundato. Suturis valdè excavatis. Aperturâ circulari.

Length of fragment,	1 inch	9 lines.
Total length of spire restored,	2 inches	9 "
Width of last whorl,	1 inch.	
" of peristome,		8 "

An obtuse thick-shelled species, with the upper and lower surface of the whorls bevelled towards the suture, ornamented with two spiral keels, the lower of which is the most prominent.

The collection contains three fragments of this species, the largest of which is figured in the Asiatic Researches, loc. cit. and also in the accompanying Plate I.

Judging from its appearance (mineral character) it is from the same beds as the *Ceratite* and *Ammonites Gerardi*.

17. *PLEUROTOMARIA*, sp. ? Plate IV. figs. 3, 3a.

Some fragments of casts of a small turretted species with sub-angulated whorls, evidently belong to this genus. The upper surface of the whorls is flattened and oblique, the base convex, and marked on the cast with 4 equidistant ridges, the interval between the posterior ridge, and the keel being twice as great as that between the ridges. Aperture sub-pentangular, rounded in front.

18. *PLEUROTOMARIA*, sp. ?

A flat Solarium shaped cast, much distorted by pressure, and water-worn, evidently distinct from the above.

## Class. CONCHIFERA.

19. *ASTARTE MAJOR*, Sowerby.

*Unio?* and *Trigonia?* Herbert and Everest, Gleanings in Science, Vol. III. p. 272, Plate XVII. figs. 4a, b.

*Unio?* Everest, As. Res. Vol. XVIII. Part 2, p. 114, Plate II. figs. 26, a, b, c.

*Astarte planata*, Sowerby, Op. cit. p. 278.

*Astarte major*, Sowerby, Geol. Trans. 2nd series, Vol. V. Plate LXI. fig. 1.

This species, three specimens of which occur in Dr. Gerard's collection, is undoubtedly identical with the Cutch species named as above by Mr. Sowerby. The specimens are smaller than those from Cutch, but in form, only differ in that the anterior end is less truncated, and the length of the shell is somewhat less proportionally, than in the specimen figured in the Geological Transactions, which is stated to be somewhat *wider* (i. e. in the present terminology, *longer*) than the average. The measurements of our largest specimen are as follows:—

Length 2 inches 3 lines.  
 Height 1 inch 7 „  
 Thickness 1 „

20. *CYPRINA? TRIGONALIS*, D. S. Plate IV. figs. 4, 5.

*C. testâ* trigono-cordiformi, crassâ, sub-inflatâ, striatâ, anticè rotundatâ, posticè angulatâ, obtusè carinatâ. Area posteriori levigatâ. Umbonibus prominentibus.

Length 1 inch.  
 Height 10 lines.

A small trigonal shell, chiefly occurring as casts, and of somewhat doubtful genus. It is associated with *Avicula echinata* in sandstone.

21. *NUCULA CUNEIFORMIS*, Sowerby.

*Modiola*. Herbert, Glean. in Science, Vol. III. p. 272, Pl. XVII. figs. 5a, b, c.

*Modiola*. Everest, As. Res. Vol. XVIII. Part 2, p. 114, Pl. II. figs. 28, a, b, c.

*Nucula*. Sowerby, As. Res. Vol. cit. p. 275.

*Nucula cuneiformis*. Sowerby, Geol. Trans. 2nd Series, Vol. V. Plate XXII. fig. 4.

Most of the specimens of this shell are much crushed, and the valves being united, do not admit of examination of the hinge. A small cast, however, apparently identical, but probably from a different bed, shews that the shell is, as surmised by Mr. Sowerby, a *Nu-*

*cula*. Allowing for the distortion of the specimens, the form so closely resembles that of *N. cuneiformis* from the Cutch Oolites that I cannot hesitate to regard them as specifically identical.

Length 1 inch 1 line.

Height 7 lines.

Thickness 7 ,, approximately.

## 22. CUCULLÆA VIRGATA, Sowerby.

*Arca*. Herbert, Glean. in Sc. Vol. III. p. 272, Pl. XVII. fig. 6.

*Arca*. Everest, As. Res. Vol. XVIII. Part 2, p. 114, Plate II. fig. 27.

*Cucullæa virgata*. Sowerby, Geol. Trans. 2nd Series, Vol. V. Pl. XXII. fig. 1.

The specimens of this shell are much crushed, so that their form is not accurately determinable, but it appears to be identical with the Cutch species, and is characterised by similar sharp radiating ribs, with lines of growth strongly marked towards the margins.

## 23. INOCERAMUS ?

A large concentrically-undulated shell, in bad preservation, appears to belong to this genus. Also a smaller fragment, marked with deep broad concentric furrows distinct from the above. The specimens are insufficient to admit of specific description.

24. MONOTIS CONCENTRICUS, n. s. Plate IV. figs. 6, 6a, 7.

*M. testâ obliquo-pyriformi, inæquivalvi, anticè excavatâ, posticè rotundatâ. Valvâ sinistrâ inflatâ, concentricè undulatâ; umbone prominenti incurvatâ. Valvâ dextrâ convexâ, obliquè orbiculari; margine cardinali rectâ; concentricè striatâ, supernè angustè incisâ.*

Length about 1 inch 3 lines.

Width 1 ,,

Thickness 7 ,,

In form, and in the sculpturing of the left valve, much resembling *Inoceramus concentricus* of the Gault. The right valve resembling that of an *Anomia* in form, with a deep linear notch just under the hinge line. The specimens are not very perfect. They are embedded in a black siliceous stone, similar to that of the nodules in which the *Ammonites* are enclosed. They are associated with *Boleminites Sulcatus*.

25. *AVICULA ECHINATA?* Sowerby.

Some specimens of sandstone are full of the valves of an *Avicula*, which appears to be identical with this widely ranging Oolitic species. None of them are sufficiently perfect to enable me to identify them with certainty, but the form of the ornamented valve, and the sculpturing, so closely resemble those of the type specimens, that there is at least great probability of their identity. If any thing, the Spiti specimens are somewhat more orbicular than those of Europe, but they vary somewhat in form, unless I have confounded two distinct species; a question, which the state of the specimens does not enable me to decide satisfactorily.

26. *MYTILUS MYTILOIDEA*, n. s. Pl. IV. fig. 8.

*M. testâ semiovatâ, elongatâ; anticè truncatâ, angulatè planatâ, rectâ; posticè rotundatâ; concentricè striatâ, haud costatâ.*

Length 2 inches.

Height 1 „

This shell has precisely the form of the common *Mytilus edulis*. The umbo of the only specimen in the collection, is wanting.

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Sub-kingdom. ANNULOSA.

Class. ECHINODERMATA.

27. *SALENIA?* Pl. IV. fig. 9.

An internal cast of a depressed spheroidal *Echinid* with narrow ambulacra, pores in simple pairs, broad interambulacra with five or six plates in each row, and a very large circular disc, the plates of which are not however distinguishable. As regards form it might be either a *Cidaris* or one of the *Salenidæ*, but the size of the disc is such that it can only be referred to the latter family. It seems improbable from its association with Oolitic forms that it should belong to the genus to which I have referred it provisionally (all the known *Salenias* being cretaceous), but the disc is much larger than any known species of the oolitic *Acrosalenia*.

## LIST OF ILLUSTRATIONS.

## Plate I.

Figs. 1, 2 *a—c*, *Phragmacone* and guard of *Belemnites sulcatus*, Miller.

„ 3, 3*a* *Ammonites acucinctus*, Strachey.

- Figs. 4      *Ammonites Wallichii*, Gray; *a*. suture.  
 „ 5, *a—b*, *Ammonites octagonus*, Strachey; *c*. suture.  
 „ 6, *6a*, *Ammonites Nepalensis*, Gray.  
 „ 7, *Turritella ? montium*, Blanford.

## Plate II.

- Figs. 1, *1a—b*, 2, 3, *Ammonites communis*, Sow. See note, p. 124.  
 „ 4, *4a*, *Ammonites Spitiensis*, Blanford; *b*. suture.  
 „ 5, Suture of *Ammonites biplex*, Sow.  
 „ 6, *6a*, *Ammonites Gerardi*, Blanf. Sep. *b*. suture.  
 „ 7, *7a*, *Ceratites Himalayanus*, Blanf.

## Plate III.

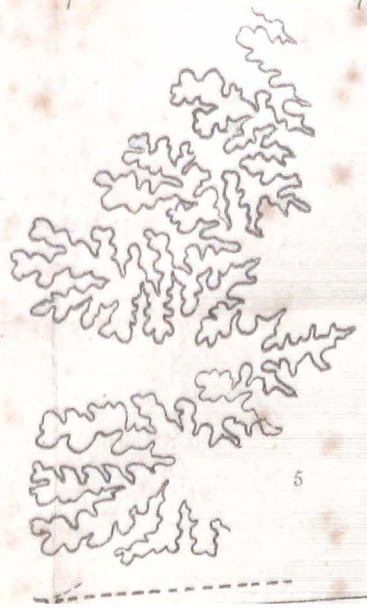
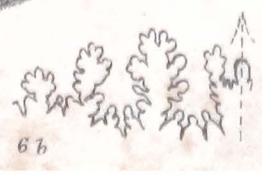
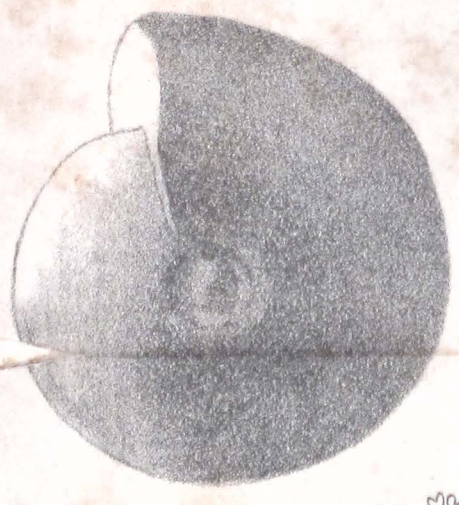
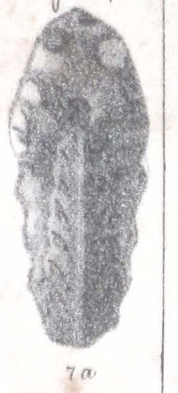
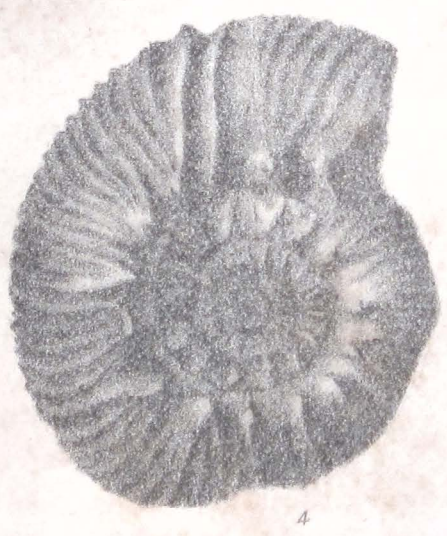
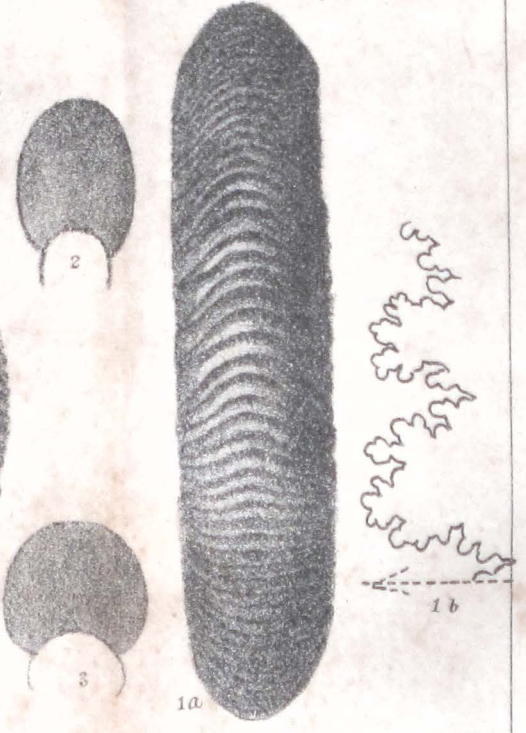
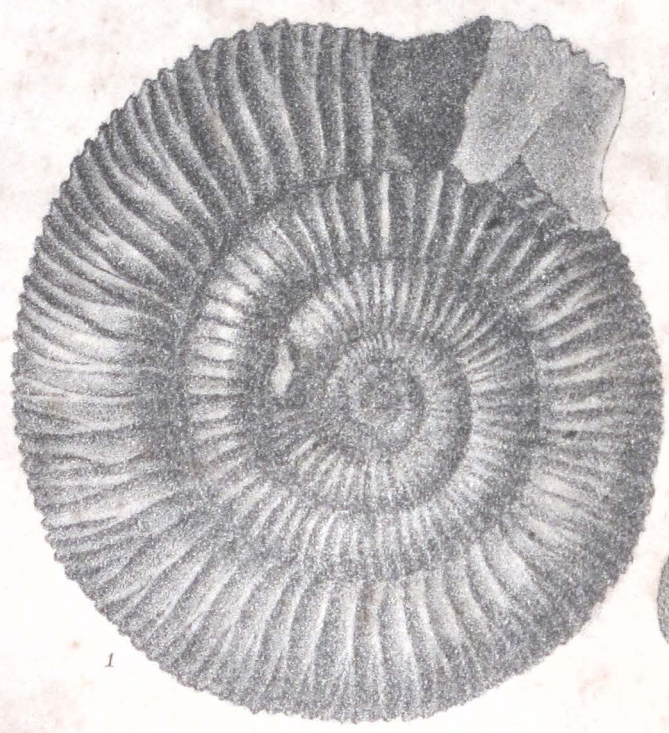
- Figs. 1, *1a*, *Ammonites Strigilis*, Blanford.  
 „ 2, 3, *Ammonites Wallichii*, Gray.  
 „ 4, *4a*, *Ammonites biplex*, Sowerby; *b*, *c* first and sixth sutures  
     of the same *Ammonite*.  
 „ 5, Suture of another specimen.  
 „ 6, *6a*, 7, *7a*.—*Ammonites torquatus*, Sowerby.  
 „ 8, Suture of the above.

## Plate IV.

- Figs. 1, *1a*, *Ammonites guttatus*, Strachey; *b*. suture.  
 „ 2, *2a*, *Ammonites Hyphasis*, Blanford; *b*. suture.  
 „ 3, *3a*, *Pleurotomaria*.  
 „ 4, 5, *Cyprina ? trigonalis*, Blanford.  
 „ 6, *6a*, 7, *Monotis concentricus*, Blanford.  
 „ 8, *Mytilus mytiloidea*, Blanford.  
 „ 9, *Salenia ?*

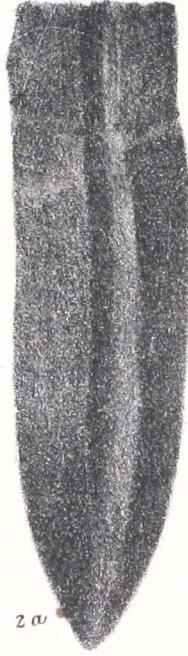








1



2a



2b



7



2c



3



3a



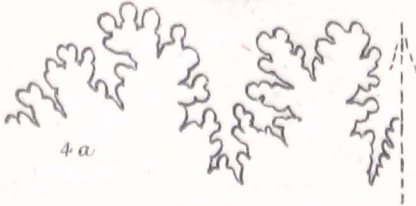
6



6a



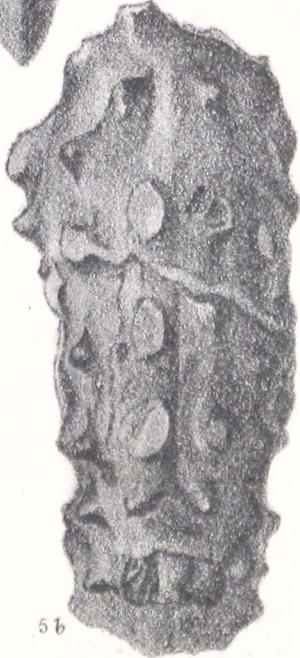
5c



4a



4



5b



5a

