squarer, and the triangular projection of the middle over the head is not so great and is wider; the posterior angles are rounded at the points and channelled. The elytra are widest about the middle, and slope more gently both backwards and forwards; the swollen lateral expansion is longer, narrower, and not so tumid; the humeral blade is longer; the suture in the male is curved concavely behind the middle, and the apex truncate obliquely, terminating at the sutural angle in a sharp little yellow tooth; in the female the suture is straight, and the apex rounded ovately; tibiæ simple.

This I think the handsomest of the West-African Lycidæ. It is apparently rather rare, not many specimens having reached me.

§ 3. Elongate, attenuate at the apex; the elytra in neither sex expanded nor armed with blades or spines on the shoulders.

14. *Lycus sinuatus*, Schön. Syn. Ins. iv. App. p. 28. Pl. IX. fig. 21.

Of this I received several specimens, divisible into two groups, one larger than the other, and with longer and proportionately more slender antennæ: they were, doubtless, the sexes, the one with longer antennæ probably the male. The abdomen in some is black, but in most is slightly margined with yellow; and the median black stripe on the thorax is broader in some than in others.

[To be continued.]

XLII.—*On* Ellipsoidina, *a new Genus of Foraminifera**.

By Giuseppe Seguenza, Professor of Natural History in the Royal Lyceum, Messina. *With further Notes on its Structure and Affinities*, by Henry B. Brady, F.L.S., F.G.S.

[Plate XIII.]

[A portion of the following translation was prepared some years ago; but the difficulty of accepting the author's conclusions, without some modification which there was then no means of verifying, caused it to be laid aside. Quite recently I have received from Professor Seguenza a number of specimens, the careful examination of which has led to results differing in one or two important particulars from those detailed in his paper,

* From the 'Eco Peloritano, Giornale di Scienze, Lettere ed Arti,' Anno v. serie 2ª. fasc. 9.

and more in accordance with the phenomena observable in allied Foraminifera. His introductory observations seem of sufficient general interest to warrant reproduction: the paper has therefore been translated entire, with the exception of the concluding portion (referring to specific subdivision), which is based upon views since abandoned by the author. The notes and supplementary matter are placed at the end as an appendix.—H. B. B.]

"Natura maxime miranda in minimis."—*Linnæus.*

"BEFORE the celebrated Italian, Soldani, had commenced his elaborate researches upon the microscopic creatures now known under the name of *Foraminifera*, several other authors had mentioned them in their writings, *e. g.* Beccarius*, Plancus†, Gualtieri ‡, Ginanni §, Ledermüller ‖, and others; yet it was Soldani who, by close and persevering study, opened an unlimited field for future discovery by the publication of his widely celebrated works¶.

"Subsequently the immortal Linnæus, by classifying them amongst other animals, endowed these little beings with scientific importance—an importance further increased by the work of Fichtel and Moll**, published in 1803, in which the Foraminifera are well illustrated and described. Accumulated observations afterwards opened the way for the dismemberment of the large genus *Nautilus* of Linnæus, which was effected by Lamarck†† and Montfort‡‡.

"The indefatigable Alcide d'Orbigny followed, and, by his unremitting labours and accurate observations upon these little animals, succeeded in forming his 'Tableau des Céphalopodes,' by classifying in genera all the known species, together with those he had himself discovered. Till then it had been firmly believed that these microzoa were Cephalopods, because they are provided with many-chambered shells, as some Cephalopods are; and the observations of M. d'Orbigny up to that time only confirmed this idea. Alas! to what great mistakes anticipation may lead! We may from this error learn how much impartiality and accuracy is needed in every kind of observation, and especially in those pertaining to microscopical

* De Bononensi arena (Comment. Academ. Bonon. i. p. 68).
† Ariminensis, De conchis minus notis. 1739.
‡ Index testarum conchyliorum. 1742.
§ Mare Adriatico, opere postume. 1757.
‖ Amusements microscopiques. 1764.
¶ Saggio orittografico, ovvero ec. 1780, e Testaceographia.
** Testacea microscopica &c.
†† Animaux sans Vertèbres.
‡‡ Conchyliologie systématique. 1808.

science. But it was given to the celebrated M. Dujardin to discover the simplicity of the organization of these animalcules, and to demonstrate that they are only formed of a fleshy mass, resulting from the coalescence of numerous filaments, and filling a calcareous shell, through the pores of which the filaments pass, performing the office of locomotive organs. By reason of the great simplicity of their structure, they were placed amongst the lowest of the zoological series, near the zoophytes.

"De Férussac would not bow to the clear and well-proven discovery of Dujardin, but adhered to the former belief. Not so D'Orbigny, who, struck by the clear light of the newer views, gave up his opinion to adopt them, and, devoting increased attention to the Foraminifera still living in the sand of our seas, as well as to those which have left their shells in the rocks formed from marine deposit, established a methodical classification which is still followed, and compiled many interesting and valuable treatises, amongst which are numbered those in which he gives his observations on the Foraminifera of the Canary Islands and of South America, of the fossils of the white Chalk of Paris and of the Tertiary basin of Vienna, together with other valuable memoirs.

"Numerous other zoologists have continued the investigation of this class of Radiata, amongst them Deshayes and Michelotti, and more recently Reuss, Czjzek, and Costa, who, pushing forward in an unlimited field, have by their researches added many new facts to the interesting science of minute life.

"Whilst zoologists by their researches have settled the position of these Radiates, they have not been of one accord as to the name to be assigned to them; and science has been retarded by the useless differences that have thereby arisen. Thus Blainville called them *Bryozoaires*; Dujardin, *Rhizostomes* or *Simplectomères*; Deshayes, *Polypodes*; Michelotti, *Rhizopodi-Foraminiferi*; Menke, *Trematophores*; and, finally, D'Orbigny used the term *Foraminifères*, which denomination has been adopted by modern writers.

"Although animals of this class are endowed with extreme minuteness, they are equally remarkable for the immense multiplication of individuals, so that a handful of our sea-sand may contain several thousands of specimens; and not only do they manifest themselves in such large numbers in the present geological period, but they must have existed to even greater extent in the Tertiary epoch, to have formed the numerous rocks and extensive strata which in certain places are built up of their fossil shells. And though not a few writers have described the Foraminifera of particular beds, if we consider how

limited in number are the localities explored in comparison with those still to be worked out, we must believe that palæontology is still to be enriched by countless new species, and within a few years it must record in its annals many fresh genera and novel facts concerning them.

"Our own island of Sicily, which has been but little searched by the palæontologist, has been still less studied in respect to its Foraminifera; in fact nothing is known concerning them, except the few species mentioned by Sig. Hoffmann and repeated by Calcara, and those recently discovered by Prof. O. Costa, of which the names alone are given in his 'Paleontologia del Regno di Napoli.' Yet the number of their calcareous shells occurring in the Tertiary beds of Sicily is very great, and the variety of species, recognizable by their fossil remains, considerable.

"In my palæontological researches in the district of Messina, I have frequently met with enormous Foraminiferous deposits; and from them I have already obtained the fossil shells of about three hundred species, which in the course of their successive discovery have confirmed my belief in the existence of Miocene strata on the two opposite sides of the Peloritan chain*. Their general characters and similarity to species already known yield a strong support, an undeniable evidence, and a clear argument in favour of my views of the geological structure of the neighbourhood of Messina. The object of the present memoir is to describe a new generic form of these minute shells, which I have observed in the Miocene marls of the locality alluded to.

"Amongst the numerous beautiful and striking forms I have noticed there is one which has the external characters of an *Oolina*, perfectly oval or ellipsoidal in shape, and terminating in a tube not showing on its external surface, even under the microscope, any trace of sutural constriction. From these characters I believed it at first to be a Monostegian Foraminifer, in reality an *Oolina*, very much resembling, if not identical with, the *O. ellipsoides* of Costa. On breaking the shell, however, the reality proved to be in complete opposition to the ideas I had formed from its external features. It was seen to consist of a series of chambers, similar in shape but decreasing in size, each succeeding chamber completely enveloping the previous one. The chambers, however, are not concentrically arranged, but each is fixed by the inferior extremity to the base of that which contains it, whilst the extremity of the tube is fixed where that of the exterior chamber commences.

* *Vide* "Del terreno Miocenico osservato sui versanti della Catena Peloritana" (Eco Peloritano, Anno v. serie 2ª. fasc. 5).

"Such being the structure of the calcareous shell, it may easily be seen that the chambers, besides being of uniform shape, are so arranged that their axes are in a right line, each chamber being altogether closed and fixed at both extremities of its longer axis. It is therefore evident that this Foraminifer belongs to D'Orbigny's order *Stichostègues*. Further, it becomes the type of a well-defined genus, approaching in its structure the *Glandulinæ* and *Nodosariæ*, but showing the successive chambers completely enveloping each other, whilst in the *Glandulinæ* they appear in part projecting to the exterior, and in *Nodosaria* they are placed one on the top of the other, overlapping each other but little, if at all. This will show clearly how well-defined is the new genus, which I name *Ellipsoidina*, and that it is related to *Nodosaria* through *Glandulina*.

"By minute study of these microscopic shells, I succeeded in distinguishing three specific forms belonging to the genus in question; and after I have recapitulated the generic characters, I shall describe the species.

"I was led to adopt the name *Ellipsoidina* in order to preserve the generic terminology of the class, inasmuch as almost all authors who have written on the subject, and especially D'Orbigny, have derived the chief portion of their generic terms from resemblances in external form: hence the name given, referring to the nearly elliptical contour of the shell, is consistent with common usage.

Characters of the Genus.

Ellipsoidina, mihi.

"Shell free, regular, ovato-ellipsoidal, vitreous in texture, terminated at one extremity by a tube, which is closed at the base where it joins the shell. In the interior are a series of chambers similar to the external one, decreasing in size, which successively completely envelop each other, each attaching itself to the base of that which immediately encloses it, and fixing itself to the apex of the same by means of the extremity of the tube.

"*Relations and Differences.*—This genus, as I have already remarked, is closely allied to *Glandulina*, but it has sufficiently distinct characters. The most remarkable fact is that, although *Ellipsoidina* is multilocular, and hence very distinct from the order Monostegia, still it is impossible, from exterior appearance, to distinguish it from *Oolina*, so much do they resemble each other externally; indeed the form of the shell, the absence of pores, the elongation of the anterior portion into a tube, the

absence, in short, of every mark that would indicate the plurality of chambers, are characters which accord well with those of *Oolina*, whilst those of *Ellipsoidina* have their origin, as we may readily understand, in the arrangement of the chambers.

"It must still be noted, however, that this genus presents certain peculiarities altogether dependent on the disposition of the various portions of the shell. In general the chambers of a multilocular shell are in direct communication with each other by means of apertures or pores variable in size and form, so that each cell opens into the interior of that which immediately follows it. This is not the case in *Ellipsoidina*, the cells of which have no apertures; and should a perforation be found in the base of the tube at the anterior portion of each chamber, this is not in communication with the succeeding ones, whilst the extremities of their tubes are adherent to the anterior portions of the enveloping chambers.

"*Distribution.*—The three species of *Ellipsoidina*, that up to the present time I have been able to observe, belong to the Miocene epoch, and appear in the marls of many localities around Messina, and not far distant from it."

Then follow the descriptions of three forms differing in little beyond the mere variations of external contour indicated by the trivial names assigned to them—*E. ellipsoides*, *E. oblonga*, and *E. abbreviata*. I gather, from a letter received but lately from Prof. Seguenza, that he has abandoned this subdivision, a conclusion in which, judging by analogy, I should entirely agree; so that it is needless to repeat the details of their supposed differences. The precise localities given are, for the first-named (typical) form, the beds in the neighbourhood of Scoppo, Gravitelli, Scirpi, and S. Licandro, in all of which places it is very common, and those of Masse, in which it is rare. The second form is stated to be found near Scirpi, Scoppo, and Masse, but always rare; and the third at Scirpi and Scoppo, likewise uncommon.

The genus may be regarded, therefore, as represented by one species only, having the following characters:—

Ellipsoidina ellipsoides, Seguenza.

Shell oval, oblong or subspherical; posterior extremity rounded, anterior more or less obtuse, sometimes terminating in an elongate tube-like process, which is either cylindrical or somewhat obconical. Chambers numerous (two to five). Colour white, opaque; young and small specimens subhyaline. Surface smooth. Length $\frac{1}{25}$ to $\frac{1}{12}$ inch.

The Foraminifera brought under notice in the foregoing memoir are in a high degree interesting from certain peculiarities of structure not hitherto recognized in members of the group to which they belong. It is necessary, however, in the first place to notice one or two errors in the description of the genus; and this I am enabled to do (through the courtesy of Professor Seguenza) from observations made upon specimens collected in the Sicilian localities alluded to in the text.

That we have in these beautiful little shells from the Miocene Clays representatives of a new subtypical form of Nodosarian Foraminifera, no one will doubt; but the characters assigned to them would indicate, if correct, not merely generic or subgeneric peculiarities, but rather a plan of growth entirely new to the order. The most important of these is indicated by the statement that there is *no communication between the interior of one chamber and that of the succeeding one*. This is probably intended to mean intercommunication in the ordinary way by a central orifice, though no qualification is made of the broad general statement. Were such a supposition verified, it would necessitate the conclusion either that the animal vacated the smaller chambers as succeeding larger ones were formed, or that the minute foramina existing in the shell-wall were sufficient for the exercise of its functional requirements so far as concerned the intercommunication of the sarcode-segments—suppositions equally without parallel in the economy of species whose shell-structure has been well made out. The difficulty of accepting the relation of parts indicated in the sectional diagram accompanying the original paper led to the observations of which I now give the results.

The normal mode of growth amongst the straight *Nodosarinæ* consists in the formation of a straight line of sarcode-segments united by narrow stolons. Each new chamber-wall is produced by the deposit of a calcareous test on a lobe of sarcode issuing from the terminal aperture of the last-formed chamber. Hence each stolon represents the interior of what was in its turn the terminal aperture, and its length depends on the character of the orifice. In some species, in which the mouth does not protrude, the length of the stolon is only as much as the thickness of the shell-wall, whilst in others the chambers are surmounted by a neck nearly equal in length to the main body of a segment. Prof. Seguenza's figures of *E. ellipsoides* show a long terminal neck somewhat of the latter description, as indicated by the dotted lines in figs. 1 & 2, Pl. XIII. Unfortunately no specimen has come under my notice in this condition; consequently my remarks are founded on the corresponding structures in the interior of the shell.

On exposing the interior of the shell, by carefully breaking away the chamber-walls (fig. 4), or on mounting young and transparent specimens in Canada balsam, it is seen at once that the column extending from the apex of the primordial chamber (or sometimes from within it) to the anterior of the terminal segment bears only superficial resemblance to the neck in the chambers of the *Nodosariæ*, and is in no way its homologue: indeed the description of it in the memoir under notice is correct in most of its features. The term "tubular," as applied to it, is apt to mislead; for although in form the column is often cylindrical and hollow, the walls have almost invariably perforations of considerable size, and are often even split up into several smaller and independent portions. Figure 5 is a drawing of one of these divided into three spreading arms; and in fig. 6 the tendency to separate into several distinct members may be well seen. When partaking more of the cylindrical or tubular form, a high magnifying-power and careful regulation of the light will generally show the existence of perforations, longitudinal and slit-like, from which it may be inferred that the column consists of delicate lines of shell-substance associated in perpendicular bundles. This conclusion is further strengthened by the frequent occurrence of surface-irregularities running in the same direction. When the column takes the common and more or less tubular form, its apex is usually swollen at the point where it joins the enveloping chamber, whilst nearer the base little, if any, alteration in diameter is observed; in some instances it tapers regularly down to the point of junction with the inner chamber.

The shell-wall is not, *as a rule*, perforated at either the anterior or posterior extremity within the walls of the column. In the exceptional cases in which an orifice occurs in the portion of the chamber-wall corresponding to the upper end of a segment of the central column, it may or may not form the channel of communication. But the function of the central body is not that of a stoloniferous tube; and when it performs this office (if ever), it arises from casual irregularity in growth. The purpose which it serves is, I believe, purely that of a support for the chambers, which are otherwise so lightly held together that the slightest shake would separate them. The adhesion between the posterior portions of the chambers is scarcely perceptible, and amounts to little more than the mere juxtaposition of surfaces. If Professor Seguenza's figures be drawn from perfect specimens, and not from such as have had the outer chamber broken away, it would follow that the support is formed before the enveloping chamber. The form of the column and its relation to the shell make it improbable

that this is the usual order of growth; and as, in the only two instances I have seen of segments having the central pillar incomplete, the portion formed was attached to the inner surface of the apex of the enveloping chamber, I am disposed to think that, as a rule, this portion of the shell is built up on an entosolenian plan. It occasionally happens (as in fig. 5) that, on breaking a shell, the central column remains attached to the inner chamber, leaving the outer one at its point of union; but this is quite an exceptional case; for in a very large majority of instances the fracture takes place at the opposite extremity. On the other hand, the tendency to entosolenian growth is evinced strikingly in the somewhat anomalous condition of the first and second chambers of a large specimen shown in fig. 11, in which the primordial chamber, containing nothing requiring support, has a rudimentary tongue-like extension of shell-substance from the interior apex. It may be noted, also, that Signor Seguenza figures one of his varieties without any external tube. I suspect, therefore, that, having found in one or two instances an ectosolenic tube arising from the breaking-away of an enveloping chamber, the conclusion has been drawn without further investigation that specimens not presenting this outgrowth were imperfect. I speak with considerable reservation, as none of the specimens which have fallen into my hands had an ectosolenian neck, or indeed any evidence that such had ever existed.

But, recognizing the fact that the central column is not the counterpart of the produced septal orifice seen in many *Nodosarinæ*, in other words, that it is not a stoloniferous tube, we have still to find how communication between the chambers is kept up—a matter of greater difficulty than at first sight appears, on account of the extreme brittleness and delicate texture of the shell. The condition shown in fig. 11, being in other respects monstrous, is of little value as an indication that the septal orifice may occur at the summit of the central column; nor is it needful to dwell upon it, inasmuch as I have never seen another example with similar characters. The usual form of the aperture is that of a curved slit, either entire or bridged over here and there, situate at a little distance from the periphery of the column, and to some extent concentric with it. The only two perfect specimens which I have left are almost exactly alike in the aspect of the *exterior* aperture; and fig. 8, drawn from one of them, would answer equally well for either. The projecting tongue of shell-substance in the centre is somewhat raised, and has a valve-like appearance on being viewed more laterally. In figures 9 & 10 the septal orifices of *inner* chambers are shown, one of them with, the other without, the

succeeding internode of the column; whilst figures 6 & 7 show the perpendicular relations of similar structures taken from other specimens. Altogether *Ellipsoidina* differs strikingly in the character of its septal and pseudopodial orifices from other genera of *Nodosarinæ*; and it exhibits no tendency to assume the radiate corona, the circular lip, or the pouting aperture common to some portions of the group.

It has been stated that the texture of the shell is singularly delicate. This is especially true of the inner chambers, which have at the same time a roughened surface not easy to account for. It can scarcely be called crystalline; yet it seems to present minute angles which sparkle in a strong light, as though covered with a glistening dust. I can scarcely, without more opportunity for pursuing the subject than I have yet had, offer a satisfactory explanation of this appearance. Circumstances lead me to think that the peculiar condition of surface arises from the partial re-solution of an originally smooth and thicker shell-wall, in the process of supplying the increased requirement for calcareous matter in the formation of the later chambers. The appearance is that of a corroded surface in which crystalline structure or lines of deposit may have been rendered apparent by unequal solution. My friend Dr. Alcock has remarked a subcrystalline condition (which I have also many times observed) in the fistulose outgrowths of *Polymorphina horrida*; but this is of a somewhat different character, and may be referred to a quite distinct cause.

Another point also I must pass over, equally without comment, for want of sufficient material for definite conclusions. In the innermost chamber of one of the shells which were broken in order to ascertain the internal arrangement, a very minute nucleolar body was found slightly adhering to the interior of the cell-wall. It was a slightly rough, transparent, multicellular, calcareous shell, as represented in fig. 12, and about $\frac{1}{200}$ inch in its long diameter. It apparently had existed, free, in the body of the sarcode, and had no structural connexion with the general shell-wall. Without the opportunity of making search in other examples for bodies of the same or similar nature, it would be useless to attempt to define its office.

EXPLANATION OF PLATE XIII.

Fig. 1. *Ellipsoidina ellipsoides*, side view, × 25 diameters. The neck in this figure and in fig. 2, indicated by dotted lines, and the corresponding portion in the centre of 1ª are inserted on the authority of Prof. Seguenza's drawings.

Fig. 1ª. The same, end view, × 25 diam.

Fig. 2. *Ellipsoidina ellipsoides*, elongate form, originally described as *E. oblonga.*
Fig. 3. The same, subglobular variety, at first described as *E. abbreviata.*
Fig. 4. Same specimen as fig. 1, but with the two outer chambers partially broken away so as to show the internal structure; × 25 diam.
Fig. 5. Inner chamber of another shell, showing the central column (usually more or less tubular) tri-cleft and spreading.
Fig. 6. Part of a central column dividing near its summit into smaller members, with the portion of the shell-wall immediately above it still adhering.
Figs. 7–10 are intended to illustrate the form of the external and septal apertures. Fig. 8 is an end view of a specimen without a neck, but otherwise perfect, showing what seems to be the ordinary condition of the external orifice. Fig. 7 is a representation of a similar shell broken down the centre. Figs. 9 & 10 relate to the inner chambers.
Fig. 11. Abnormally formed primordial chambers of an elongate specimen.
Fig. 12. Multicellular nucleus found in the primordial chamber of a large example, × 180 diam.

XLIII.—*Description of a rare Indian* Clausilia.

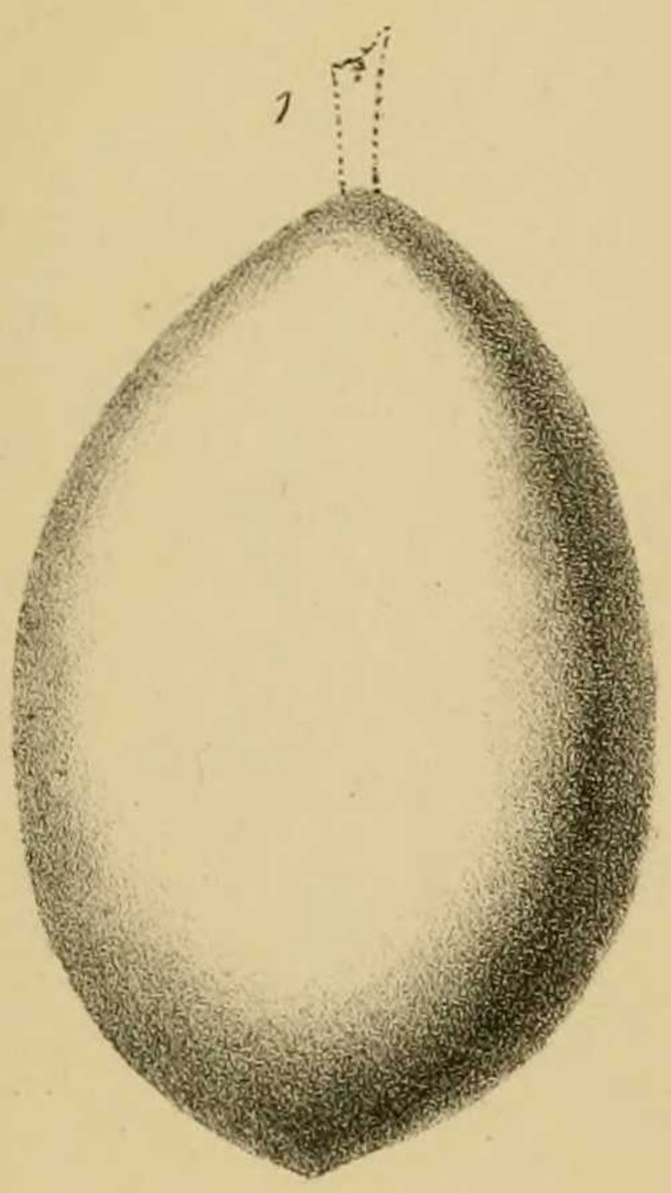
By Sylvanus Hanley, Esq., F.L.S.

Clausilia tuba, Hanley.

Testa (pro genere) magna, subcylindraceo-fusiformis, apicem obtusum versus cylindracea, albido-cornea, unicolor, tenuis, subdiaphana, haud rimata, lineis elevatis vix continuis et (præsertim in anfractu ultimo, ubi remotiores fiunt) oblique corrugata. Anfractus 10–12, sutura profunda et minime crenata divisi; apicales unice convexi, subæquales; cæteri convexi, et satis rapide crescentes; penultimus major, altior; ultimus curvatus, verticaliter descendens, infra suturam submarginatam subcoarctatus, denique insigniter dilatatus, basi rotundata nequaquam cristatus. Apertura permagna, soluta, porrecta, subcordato-rotundata, undique patentissima. Peristoma continuum, late expansum: lamella supera conspicua, angusta, arcuatim subverticalis; lamella infera adjacens, obliqua, magisque profunda; plica subcolumellaris parvula, verticalis; plica palatalis (si sit ulla) labrum haud attingens: lunella opacitate conspicua.
Long. $1\frac{1}{4}$ poll.
Hab. Shan, provinc. Ind. or. Mus. Theobald, Hanley.

I am indebted to W. Theobald, Esq., for this remarkable species, which must closely resemble the American *C. episto-mium.* It was taken by Mr. Fedden from the valley of the Upper Salwen.

1



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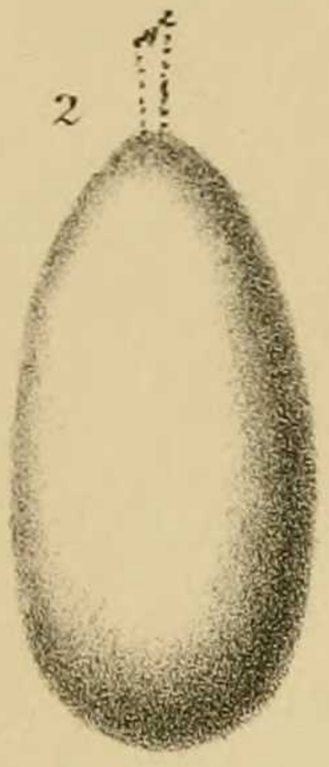

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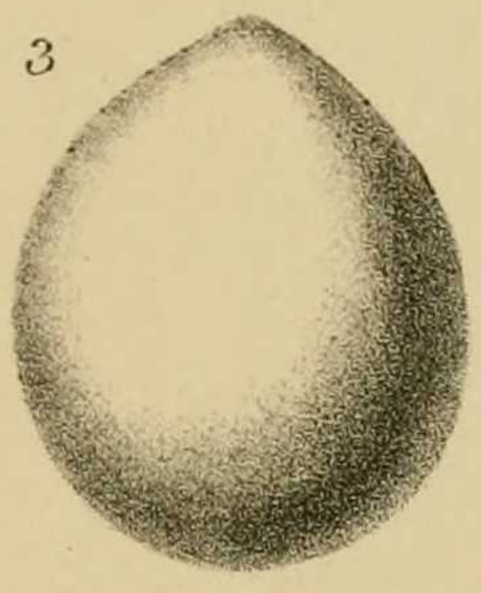

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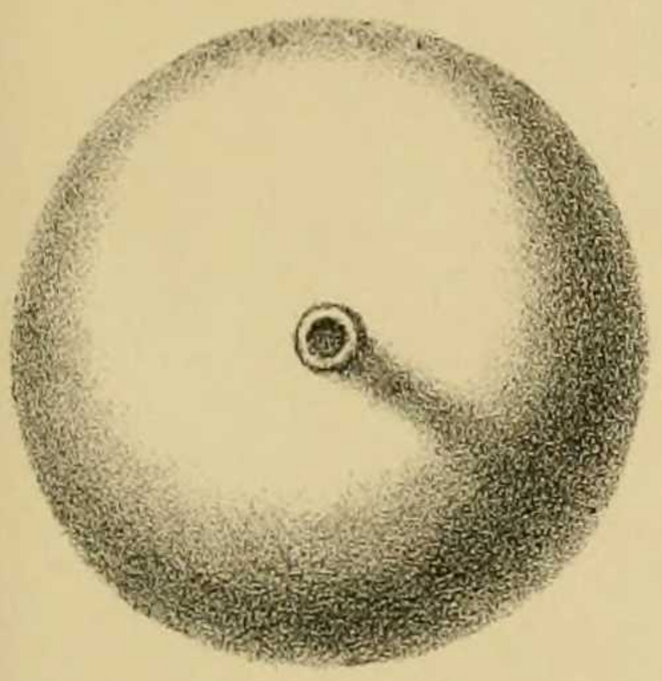

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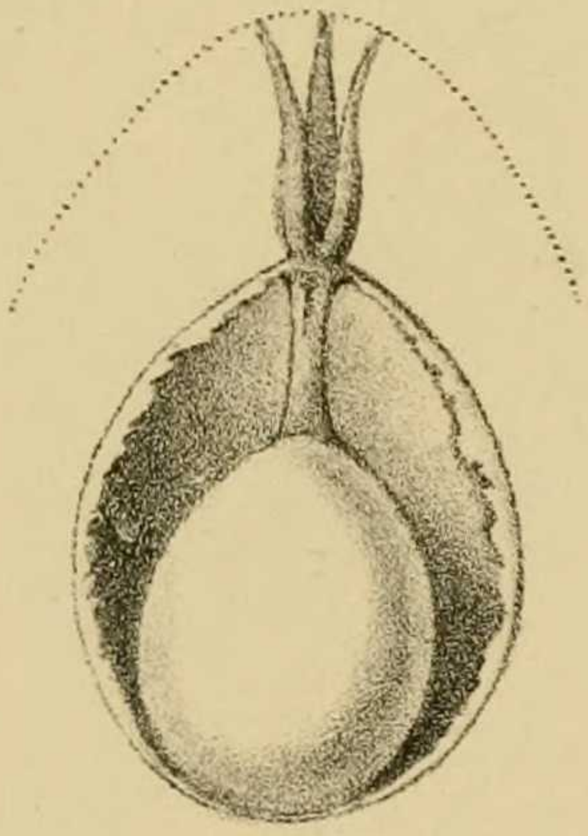

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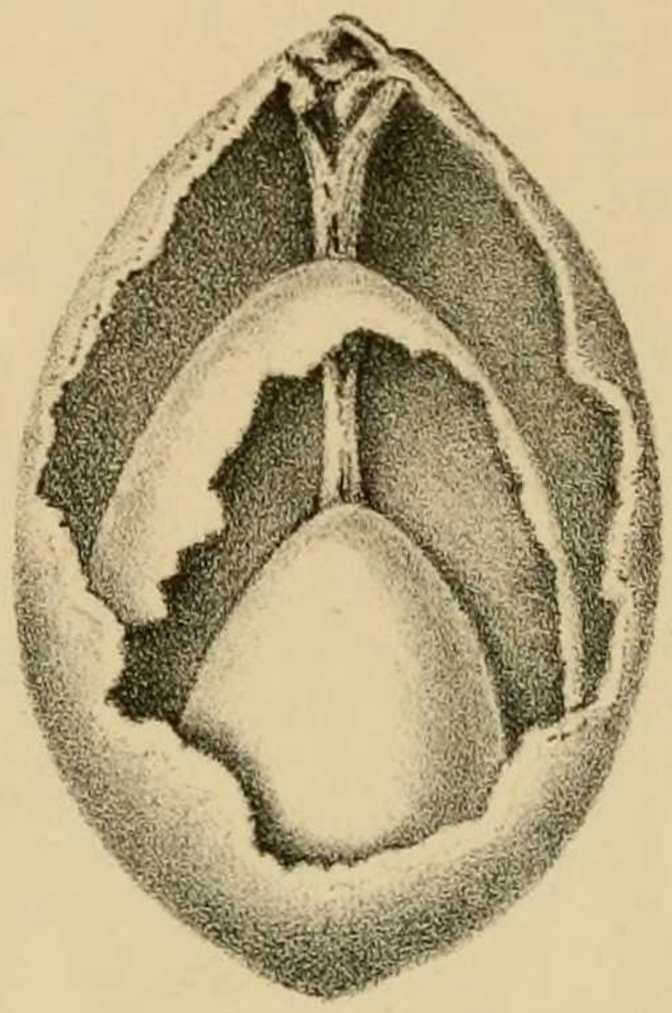

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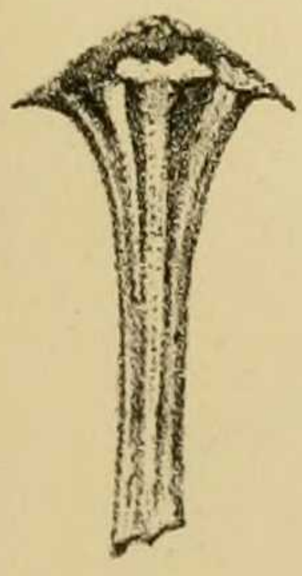

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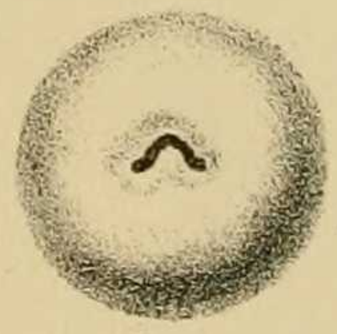

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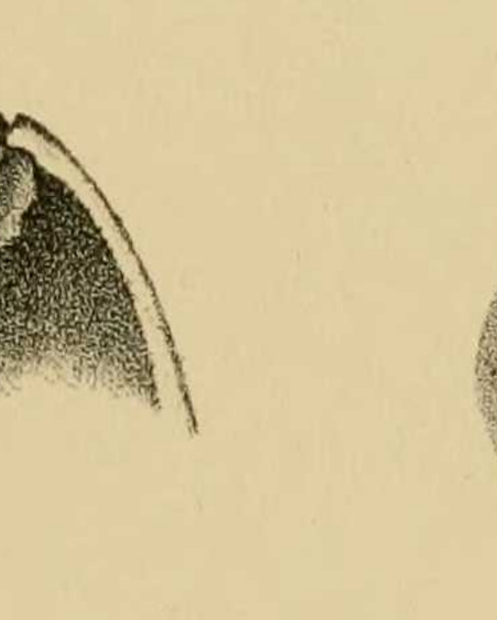

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H.B. Brady ad nat. del. Tuffen West lith.

W. West imp

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