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XXV.—Notes on the Palæozoic Bivalved Entomostraca.—  
No. XXIII. On some Silurian Genera and Species\*  
(continued). By Prof. T. RUPERT JONES, F.R.S., F.G.S.

[Plates IV., V., VI., VII.†]

CONTENTS.

- Introduction, p. 177.  
I. *Macrocypris*, p. 178.  
1. — *Vinei*, sp. nov., p. 179.  
2. — *elegans*, sp. nov., p. 180.  
3. — *siliquoides*, sp. nov., p. 181.  
4. — *symmetrica*, sp. nov., p. 181.  
5. — ? *alta*, sp. nov., p. 181.  
6. — ? *crassula*, sp. nov., p. 181.  
II. *Pontocypris*, p. 182.  
1. — *Mawii*, sp. nov. et var. *gibbera*, nov., p. 182.  
2. — *Smithii*, sp. nov., p. 184.  
III. *Bythocypris*, p. 184.  
1. — *Hollii*, sp. nov., p. 184.  
2. — ? *reniformis*, sp. nov., p. 185.  
3. — ? *botelloides*, sp. nov., p. 185.  
4. — *testacella*, sp. nov., p. 186.  
5. — *symmetrica*, sp. nov. et var. *a, b, c*, p. 186.  
6. — *concinna*, sp. nov. et var. *ovalis*, p. 186.  
7. *Bythocypris Phillipsiana*, J. & H., et var. *major*, nov., p. 187.  
8. — *pustulosa*, sp. nov., p. 188.  
9. — ? *seminulum*, sp. nov., p. 188.  
10. — *acina*, sp. nov., p. 189.  
11. — *phaseolus*, sp. nov., p. 189.  
IV. *Cythere*, p. 189.  
1. — *Hollii*, sp. nov., p. 190.  
2. — ? *Vinei*, sp. nov., p. 191.  
3. — ? *subquadrata*, sp. nov., p. 191.  
V. *Cytherella*, p. 192.  
1. — *Smithii*, sp. nov. et var., p. 192.  
VI. *Primitia*, p. 193.  
1. — *punctata*, sp. nov., p. 193.  
2. — *valida*, J. & H., p. 193.  
VII. *Incertæ sedis*, p. 193.  
VIII. Note on Dr. Lindström's Collection, p. 194.  
IX. Explanation of the Plates, p. 194.

INTRODUCTION.

At pp. 343, 344, Ann. & Mag. Nat. Hist. for April 1886, is a full account of the history of the valuable collections of Silurian Ostracoda which have been described in part by the late Dr. Harvey B. Holl and myself. Some of the *Beyrichiæ* and their allies were treated of and figured in the same number of the Ann. & Mag. Nat. Hist., and others in the number for last May, pp. 403–414, with further illustrations. I have now to continue the work without the aid of our lamented friend, except so far as many valuable drawings prepared by him, some indeed within a

\* For No. XXII. see Ann. & Mag. Nat. Hist. for October 1886, p. 249.

† These Plates have been drawn with the aid of a grant from the Royal Society for the illustration of Fossil Entomostraca. Mr. C. D. Sherborn has kindly given me help in cataloguing, comparing, sketching, and measuring the species.

few months of his death\*, are at hand for reference and comparison. Not a few of these have been incorporated in the accompanying Plates.

The Ostracoda that still remain in the above-mentioned Collections to be described are chiefly those appertaining to *Macrocypris*, *Pontocypris*, *Bythocypris*, *Cythere*, *Cytherella*, *Thlipsura*, *Æchmina*, *Primitia*, &c.; and in estimating the leading characteristics of the carapace, the relative size of the two valves, the shape of each extremity, and other features of the carapace, Dr. Holl's comparative drawings, often several for one object, are vivid expressions of his views on the subject, and frequently of much service in determining the genus and species.

## I. MACROCYPRIIS, G. S. Brady, 1867.

*Cythere*, *Bairdia*, &c., auctorum.

1867. *Macrocypris*, G. S. Brady, Intellectual Observer, vol. xii. p. 119; "Monogr. Recent Brit. Ostrac.," Trans. Linn. Soc. vol. xxvi. 1868, p. 391; Report Ostrac. 'Challenger' Exped. 1880, p. 40.

Carapace subcylindrical or long triangular, and often *Bairdia*-like, generally elongate, attenuated at the extremities; valves thin, smooth, unequal, with bevelled plates within the ends, more or less sinuate on the ventral margin, the right larger than the left and overlapping dorsally; hinge-line flexuous.

This genus is a member of the section of the Ostracoda known as *PODOCOPA*, and belongs to the family Cyprididæ, which comprises marine as well as freshwater species.

Some specimens obtained from the Silurian shales appear to belong to this genus, and represent certainly three undescribed species. Formerly such specimens were referred to *Cythere* a name used to cover the generic alliance of those small Ostracoda which could not be exactly or satisfactorily determined. Now, however, that not only *Cythere* but its allied genera have been fully elucidated in the living state, it is found that the genus does not comprehend many of the fossil forms once referred to it†. Whether these really

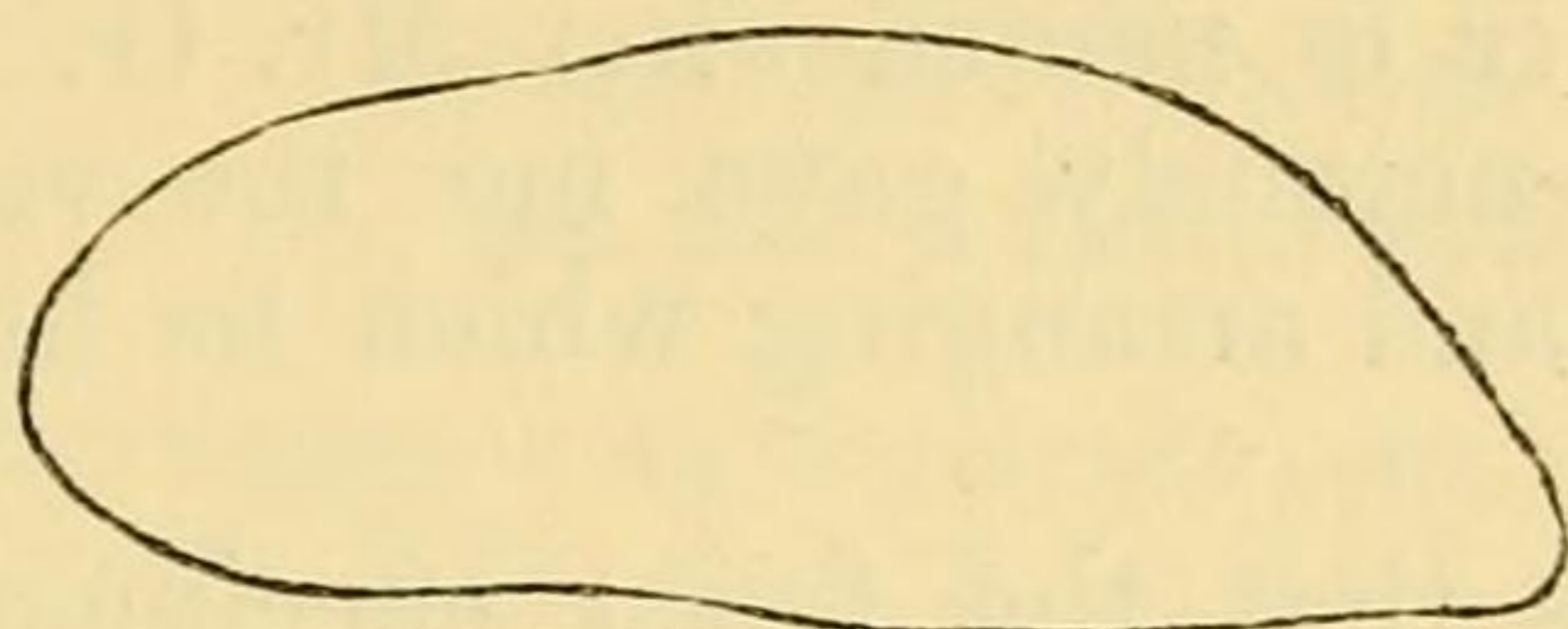
\* In September last. See Geol. Mag. for Nov. 1886, p. 527.

† Dr. G. S. Brady's researches on the Recent Ostracoda have given us much clearer views than we had heretofore of the relationship of these Bivalved Entomostraca, and have enabled us to refer several of the fossil forms to their probable genera as represented among their modern and existing allies. See, for instance, the paper on "Some Carboniferous Ostracoda," Ann. & Mag. Nat. Hist. for October 1886. Among Dr. Brady's many valuable memoirs and monographs we note more especially his "Monograph of the Recent British Ostracoda," Trans. Linn.

belong to the Cytheridæ or to the Cyprididæ it is often difficult to say; but the genus *Cythere* comprises very few of the smooth subovate forms, and none that have toothless hinges. Hence we find that a real *Cythere* is scarcely known in Palæozoic strata; and when the term is applied to such old forms it is in a very general and probably artificial sense.

1. *Macrocypris Vinei*, sp. nov.  
(Pl. IV. figs. 1, 2, 3; and woodcut.)

1882. "*Bairdia elongata*, Münster (?)," Vine, Quart. Journ. Geol. Soc. vol. xxxviii. p. 48.



*Macrocypris Vinei*, sp. nov. Thick variety (♀ ?). Magn. 25 diam.  
Vine Coll. LXV<sub>7</sub>. Bed no. 46.

		Length.	Height.	Thickness.
Proportions*:	Fig. 3:	41	14	13
	Woodcut:	40½	13	
	Fig. 1:	39	13	10
	Fig. 2:	33	10	9½

Measurements of some specimens in 1000ths of an inch:—

Length.	Height.	Thickness.	
80	29	25	Vine Coll. Bed no. 40.
80	23	20	Vine Coll. Bed no. 46.
75	27	22	Vine Coll. Bed no. 46.
65	24	18	Smith Coll. Railway, Ironbridge.

Carapace smooth, nearly equivalved, elongate, subcylindrical, tapering at each end; rounded and compressed in front, obliquely acute at the postero-ventral extremity; arched above, nearly straight below. In some cases the dorsal edges fall in a little, so that the middle of the back is slightly flattened. The ventral edge of the left valve slightly overlaps its fellow, and sometimes an overlap by the right valve on the dorsal edge is discernible, but not so strong as in most of the recent species. Some indications of a rose-shaped muscle-spot are visible.

Soc. xxvi. 1868; the "Monograph of the Post-Tertiary Entomostraca," &c., by Brady, Crosskey, and Robertson, Palæont. Soc., 1874; and Dr. Brady's "Report on the Ostracoda of the 'Challenger' Expedition," 1880.

\* If these proportional numbers be divided by 25, the results will be the real measurements in millimetres and parts of a millimetre.

Excepting that its dorsal border is much less arched, this species resembles in many respects *M. orientalis*, Brady, "Ostracoda of the 'Challenger,'" p. 42, pl. i. fig. 4.

The several specimens differ in detail. Fig. 3 shows the best example. Some are shorter and higher on the back towards the posterior third than others (woodcut, Vine Coll. LXV<sub>7</sub>). Possibly the narrow individuals were males. The relative convexity also of the lateral contour differs, being more median in some (as in fig. 3 *b*) than in others. The hinder extremity often varies in outline, probably on account of different states of preservation (figs. 1 and 2 are such casts).

This fine species is named after Mr. G. R. Vine, of Sheffield, who so generously gave me the valuable collection, on accumulating and arranging which he had bestowed much labour.

Mr. Vine states that the finest specimens of this species were obtained from the "shales over the Wenlock Limestone."

Eleven specimens :	{	Vine Coll. no. I.	Bed no. 46. Shales over Wenlock Limestone, figs. 1 and 2.
		II.	Bed no. 40. Buildwas Beds.
		LXIV <sub>7</sub> .	Buildwas Beds. Small.
		LXV <sub>7</sub> .	Shales over Wenlock Limestone. Woodcut.
		LXVII.	Bed no. 46. Shales over Wenlock Limestone.
Five specimens :	{	Smith Coll. 65.	Railway-cutting, side of Severn, Ironbridge, fig. 3.

2. *Macrocypris elegans*, sp. nov.  
(Pl. V. figs. 8 *a*, 8 *b*, 8 *c*.)

Proportions :—L. 22. H. 10. Th. 10.

An elegant, subreniform, smooth, convex carapace, higher and more boldly rounded behind than in front, as seen in the profile, fig. 8 *a*, but equally compressed at the ends, as shown by the acute-oval contour, fig. 8 *b*. The right valve is larger than the left, overlapping all round. The back is elliptically arched, the ventral margin is sinuous, and the ends unequally rounded; end view nearly round.

The *Bythocypris*? *pyrula*, J. & K., of the Mountain-limestone (Ann. & Mag. Nat. Hist. October 1886, p. 252, pl. vi. figs. 10 and 11) is not unlike this species in general appearance.

Vine Coll. (one specimen) no. III. Bed no. 40. Buildwas Beds.

3. *Macrocypris siliquoides*, sp. nov.  
(Pl. V. figs. 9 a, 9 b, 9 c.)

Proportions :—L. 22. H. 8. Th.  $6\frac{1}{2}$ .

Probably a *Macrocypris*, the right valve being somewhat larger than the left. Carapace small, long, and narrow, or elongate-amygdaloid; nearly cylindrical, but tapering at the ends, and somewhat compressed anteriorly. More arched on the back than below, where the margin is slightly sinuous and incurved.

Two specimens. Vine Coll. no. IV<sub>2</sub>. Bed no. 46. Shales over the Wenlock Limestone; and no. 22. Buildwas Beds.

4. *Macrocypris symmetrica*, sp. nov.  
(Pl. VII. figs. 8 a, 8 b.)

Proportions :—L.  $15\frac{1}{2}$ . H. 7. Th. 5.

Measurement in 1000ths of an inch :—

L. 30. H. 16. Th. 12.

Carapace small, smooth, subcylindrical, narrow, almond-shaped in profile; feebly arched above, slightly curved below, rounded at the ends, one of them (anterior) more compressed than the other. Right valve overlapping the left. Edge view narrow, acute-ovate.

This is smaller and proportionately shorter and thicker than *M. siliquoides*.

Smith Coll. (one specimen) no. 63<sub>1</sub>. Woolhope.

5. *Macrocypris? alta*, sp. nov.  
(Pl. V. figs. 10 a, 10 b.)

Proportions :—L. 13. H.  $8\frac{1}{2}$ . Th. 6.

Carapace small, convex, short, subovate, rounded above and at the ends, nearly straight below. Compressed in front, so that the lateral contour is ovate with one acute end. The right valve is apparently the largest.

Smith Coll. (one specimen) no. 53<sub>3</sub>. Railway-cutting, side of Severn, Ironbridge.

5. *Macrocypris? crassula*, sp. nov.  
(Pl. VII. figs. 10 a, 10 b.)

Proportions :—L. 19. H. 10. Th. 8.

Taking the narrowest (lowest) end for the anterior, the right valve of this carapace strongly overlaps the other. This

character is found in *Cytherella* and *Macrocypris*. The shape of this carapace does not correspond at all with that of *Cytherella*, nor closely with that of any known *Macrocypris*; but rather than make it the basis for a new genus, I have provisionally grouped this specimen with *Macrocypris*, which has the right valve larger than the left, though not so markedly overlapping all round as in this instance.

The carapace is of a narrow-subovate form with very thick valves, the right strongly overlapping the left all round. It has a considerable median convexity. Edge view compressed-oval with subacute ends; end view nearly round. At first sight this little carapace looks like a dwarf *Bythocypris Phillip-siana*, but the overlapping valve is the right instead of the left.

Unique: collected by Dr. H. B. Holl in the Wenlock Limestone, Crofts, near Malvern.

## II. PONTOCYPRIS, G. O. Sars, 1865.

*Pontocypris*, G. S. Brady, Report Ostracoda 'Challenger' Expedition, 1880, p. 35.

Several specimens in Mr. Vine's Collection have a somewhat *Bairdia*-like carapace, but having one valve overlapping the other on the dorsal border, and overlapped on its own ventral edge. This condition of the valves separates the form under notice from *Bairdia*. Its peculiar subtriangular shape presents a close analogy to that of *Pontocypris*; and as the recent forms, though with less overlap, do not gainsay a near relationship, I provisionally refer it to this genus.

### 1. *Pontocypris Mawii*, sp. nov.

(Pl. IV. figs. 4 a-4 d, & fig. 7; fig. 6, var. *gibbera*, ♀ ?.)

	Length.	Height.	Thickness.
Proportions : { Fig. 4 :	36	18	12
{ Fig. 7 :	32	16	
{ Fig. 6 : (var.)	29	18	11

Measurement in 1000ths of an inch :—

Fig. 4: L. 68. H. 35. Th. 33.

Carapace convex, triangular-ovate or subpyriform; arched above, nearly straight below; sharp, compressed, and tapering at the ends; posteriorly more attenuate, and with a longer slope than in front, where it is almost truncate, curving with a sudden slope downwards, and less compressed than behind. Thus the antero-dorsal slope is steeper and more convex than the hinder slope, which is longer and flatter, and makes the postero-ventral angle more produced than the front. The

thicker and higher end being the anterior is proved in recent specimens by the position of internal organs. The valves are smooth and subtriangular; the left overlaps the other on the dorsal border, and the right valve overlaps on the ventral border. The lateral contour (seen in the edge view) is subovate, with rather flattened sides and subacute ends; but these features differ with individuals. The shape differs from long- to short-pyriform (figs. 4 and 6). Thus, still keeping their differences within bounds, the valves are much longer in figs. 4 and 7 than in fig. 6 (var. *gibbera*). The differences between the short and hump-backed variety (fig. 6) and the long pear-shaped form (figs. 4 and 7) are striking, but not sufficient to make them specifically distinct. They may be sexual differences: the valves were probably thin in substance.

G. S. Brady's figure of *Pontocypris faba* (Reuss), "Report Ostrac. 'Challenger,'" pl. i. fig. 4, comes near to our Silurian form; but this latter seems to be distinct from any, and requires a name. I propose to name it *P. Mawii*, dedicating it to Mr. George Maw, F.G.S., who so thoughtfully had some tons of the Silurian shales near Benthall, in Shropshire, thoroughly washed and sifted, and instigated his palæontological friends to submit the sorted contents to scientific examination.

There is much resemblance between the Lower-Silurian *Cythere Jukesiana*, J. & H., Ann. & Mag. Nat. Hist. ser. 4, vol. ii. p. 57, pl. vii. fig. 6 (misprinted "fig. 7," *ibid.* p. 62), and some of the specimens before us. The former, however, has a more tapering posterior moiety (regarded as "anterior," *loc. cit.*), and less of the dorsal convexity. It is advisable to refer the above-mentioned Kildare specimen to *Pontocypris*.

Twenty-seven specimens :	{	Vine Coll. no. v. (fig. 6). Bed no. 22. Buildwas Beds.
		VI. Bed no. 25. Tickwood Beds.
		VII. (figs. 4 and 7). Bed no. 22. Buildwas Beds.
		IX. Bed no. 25. Tickwood Beds.
		LXIV <sub>16, 17, 18</sub> . Buildwas Beds.

Ten specimens :—Smith Coll. no. 56. Railway-cutting, side of Severn, Ironbridge.

2. *Pontocypris Smithii*, sp. nov.  
(Pl. IV. figs. 5 a-5 d.)

Proportions:—L. 36. H. 20. Th. 16.

Measurements in 1000ths of an inch:—

Length.	Height.	Thickness.
74	40	30
74	38	30

Carapace convex, smooth, subreniform, with rounded ends, equally compressed. The anterior half sloping down quickly and the hinder half slowly from above downwards. Back elliptically convex; ventral margin rather incurved. Left valve subpyriform, overlapping on the back, and the right valve nearly kidney-shaped, overlapping ventrally.

Smith Coll. (four specimens) no. 64. Wenlock Beds, Dudley Castle. Also found in the Woolhope Shale, at the Wych, Malvern, by the late Dr. Holl.

Dedicated to Mr. John Smith, of Kilwinning, Ayrshire, who kindly confided his Collection to me for examination, and who has thus largely added to the store of available specimens of Ostracoda from the Silurian shales of Shropshire.

III. BYTHOCYPRIS, Brady, 1880.

Carapace smooth, more or less reniform; "left valve much larger than the right, which it overlaps both on the dorsal and ventral margins" ("Report Ostracoda of the 'Challenger,'" p. 45).

1. *Bythocypris Hollii*, sp. nov.  
(Pl. V. figs. 1 a, 1 b, 2; Pl. VI. figs. 3 a, 3 b, 4 a, 4 b.)

	Length.	Height.	Thickness.
Proportions: { Pl. V. fig. 1:	35	19	15½
{ Pl. VI. fig. 3:	34	21	17
{ Pl. V. fig. 2:	34½	22½	
{ Pl. VI. fig. 4 (crushed)	33	16	15

Carapace convex, smooth, reniform, nearly semicircular on the back, gently sinuous below. Edge view acute-oval; end view ovate. Left valve overlapping the right along the ventral border and nearly all round. In these features it connects itself with *Bythocypris*. Pl. VI. fig. 3, probably the female, is higher and more ovate than Pl. V. fig. 1, being more convex in the posterior third and less incurved on the ventral border. Pl. V. fig. 2 is much higher and proportionally shorter than either fig. 1 or Pl. VI. fig. 3, with a straight ventral and a highly arched dorsal line; and one end (poste-

rior) is much less rounded, being more truncate, with a steeper slope, than the other. It is possibly an *old female* or an obese variety. Pl. VI. fig. 4, is a somewhat crushed individual.

This fine species is dedicated to the memory of my late friend and fellow-worker, Dr. H. B. Holl, several of whose careful drawings aid me in the present work.

Dr. Holl pointed out to me not long ago that this species has nearly the shape of "*Cytherellina siliqua*, var. *grandis*," J. & H. (Ann. & Mag. Nat. Hist. ser. 4, vol. iii. p. 217, pl. xiv. fig. 1), but the lateral contour (edge view) is distinctly different, as well as the end view. No doubt, however, exists that this var. *grandis* should now be regarded as *Bythocypris grandis*, J. & H. So also *C. siliqua*\*, var. *ovata*, not far removed from the present Pl. V. fig. 2, and Pl. VI. fig. 3, may be looked upon as the female of *B. grandis*.

Vine Coll. (five specimens) LXVI<sub>2, 3</sub>. Tickwood Beds.  
Smith Coll. (five specimens) no. 50. Dudley Tunnel.

2. *Bythocypris? reniformis*, sp. nov.  
(Pl. VI. figs. 1 a, 1 b, 2 a, 2 b.)

	Length.	Height.	Thickness.
Proportions : { Fig 1 :	33	15	13
{ Fig. 2 :	25	12	10

Probably a *Bythocypris*, kidney-shaped, convex, and much more compressed at one end (anterior) than the other, as seen in the edge views, figs. 1 b and 2 b. Fig. 1 a differs from fig. 2 a in being larger and not so high proportionally in front.

This species is narrower than *B. Hollii*, and has its greatest convexity at the posterior third instead of in the middle.

Vine Coll. (two specimens) no. LXVI<sub>3</sub>. Tickwood Beds.

3. *Bythocypris? botelloides*, sp. nov.  
(Pl. VII. figs. 2 a, 2 b.)

Proportions :—L. 31. H. 14. Th. 14.

Nearly oblong, convex, subcylindrical, like a sausage; upper and lower edges parallel; the ends rounded almost equally. Edge view long-oval. End view round.

Smith Coll. (three specimens) no. 81<sub>1, 3</sub>. Benthall Edge, Ironbridge.

\* Keeping for *Cytherellina siliqua* fig. 5 and those specimens that actually show the internal sulcate structure.

4. *Bythocypris testacella*, sp. nov.  
(Pl. V. figs. 5 a, 5 b, 5 c.)

Proportions:—L. 27. H. 12. Th. 10.

One specimen from Malvern: L. 60, H. 25-1000ths inch.

Long and narrow, but arched on the back; rounded at the ends and depressed along an antero-dorsal slope. Left valve largest, overlapping on the back. It has somewhat the appearance of a *Testacella* or of a hump-backed leech. Edge view long, narrow-oval. End view short-ovate.

Vine Coll. (four) no. LXVI<sub>3</sub>. Tickwood Beds.

Smith Coll. (two) no. 81. Benthall Edge, Ironbridge.

Also found by the late Dr. Holl in the Wenlock Shale of Malvern.

5. *Bythocypris symmetrica*, sp. nov. (Pl. VII. figs. 3 a, 3 b (var. c), 4 a, 4 b (var. b), 7 a, 7 b (var. a).)

	Length.	Height.	Thickness.
Proportions: { Fig. 7 (var. a):	23	12	10
{ Fig. 4 (var. b):	18½	9½	7½
{ Fig. 3 (var. c):	17	8	6

A series of smooth oblong-ovate carapaces, varying in size and somewhat in profile, from figs. 7 a to 4 a and 3 a. The uniformly narrow subovate edge views of these varieties constitute an important link in their relationship.

Nine specimens:	{	Vine Coll. no. IV <sub>3</sub> . Bed no. 46.
		XII. Bed no. 38.
		xv. (fig. 3). Bed. no. ?
Thirteen specimens:	{	Smith Coll. no. 62 (figs. 4 and 7). Railway-cutting, side of Severn, Ironbridge.
		79. Red Shale, Malvern Tunnel (west end).
		81. Benthall Edge, Ironbridge.

6. *Bythocypris concinna*, sp. nov. (Pl. V. figs. 6 a, 6 b, 6 c, and fig. 7 (var. *ovalis*).)

	Length.	Height.	Thickness.
Proportions: { Fig. 6:	23	11	9½
{ Fig. 7:	19	9	

Measurements in 1000ths of an inch :—

	Length.	Height.	Thickness.
Large individual (fig. 6 <i>a</i> ).	46	20	18
Var. <i>ovalis</i> (fig. 7). . . .	42	20	20

Carapace small, smooth, convex, acute-ovate ; not quite so much arched on the ventral as on the dorsal margin ; highest near the middle, but sloping off more gently to the anterior end, which is sharper and slightly more compressed than the posterior. The left valve (taking the most compressed moiety of the valves as the anterior) is larger than the other and overlaps it all round.

A more decidedly oval form (that is, with equal ends) is shown by fig. 7 (var. *ovalis*).

*B. concinna* has some features in common with *B. cuneola* of the Carboniferous formation, but is quite distinct in other respects (Ann. & Mag. Nat. Hist. Oct. 1886, p. 250, pl. vi. figs. 3–7).

Some rather obscure, subcylindrical, long-oval, internal casts of small valves, much like those of the above-mentioned form, were described in the Ann. & Mag. Nat. Hist. ser. 4, vol. iii. 1869, p. 212, woodcut fig. 1, as *Cythere Grindrodiana* ; but the latter are too small to be matched exactly. These little casts were from the Woolhope Shales of West Malvern.

Nine specimens : { Smith Coll. no. 61 (fig. 6). Stoke-Saye, near the Craven Arms.  
62 (fig. 7). Railway-cutting, side of Severn, Ironbridge.

Also from the Aymestry Limestone, Chance's Pitch, Ledbury (*Dr. Holl*).

### 7. *Bythocypris Phillipsiana* (Jones & Holl).

(Pl. V. figs. 3 *a*, 3 *b*, var. *major* ; figs. 4 *a*, 4 *b*, 4 *c*, *typica*.)

1869. *Bairdia Phillipsiana*, J. & H., Ann. & Mag. Nat. Hist. ser. 4, vol. iii. p. 213, pl. xiv. fig. 7.

	Length.	Height.	Thickness.
Proportions: { Fig. 3 :	27	16½	14
{ Fig. 4 :	22½	14	8

Measurements in 1000ths of an inch :—

Fig. 3 {	Left valve	56	33	
	Right valve	53	27	
Fig. 4 {	Left valve	48	27	
	Right valve	45	22	
	Thickness of carapace	.	.	17 13*

This subtriangular or subreniform carapace has been already sufficiently described in the Ann. & Mag. Nat. Hist. for March 1869, from the Wenlock Limestone, near Malvern. The present specimens, however, of the typical form (Pl. V. fig. 4) have rather thinner valves and therefore more delicate outlines in profile and contour. We recognized it also in a Scandinavian Limestone (*loc. cit.*).

Pl. V. fig. 3 shows a larger and more ovate carapace, with proportionally thinner valves (var. *major*).

The Carboniferous variety of this species (var. *carbonica*, J. & K., Ann. & Mag. Nat. Hist. ser. 5, vol. xviii. p. 250, pl. vi. fig. 1) is very much like this predecessor, with but slight modification of its features.

Vine Coll. (two specimens). Fig. 3. No. VIII. Beds no. 25 and 25\*, Tickwood Beds.

Smith Coll. (three). Fig. 4. No. 56. Railway-cutting, side of Severn, Ironbridge.

8. *Bythocypris pustulosa*, sp. nov.  
(Pl. VII. figs. 13 a, 13 b.)

	Length.	Height.	Thickness.
Proportions:—	20	11	13

Measurements in 1000ths of an inch:—

Left valve	35	18	
Right valve	31	15	
Thickness of carapace . . .			17

Carapace strong, convex, ovate-oblong, arched above, straight below; hinder end rounded; front depressed, contracted, and sloping, with an oblique curve. Left valve overlapping all round. Lateral contour (edge view) acute-ovate. Surface pimpled with (red) raised spots.

Smith Coll. (one) no. 40. Stoke-Saye, near Craven Arms.  
(three) no. 60. Railway-cutting, side of Severn, Ironbridge.

9. *Bythocypris? seminulum*, sp. nov.  
(Pl. VI. figs. 9 a, 9 b.)

Proportions:—L.  $9\frac{1}{2}$ . H. 5. Th.  $4\frac{1}{2}$ .

Carapace small, convex, subreniform, arched above, nearly straight below; ends nearly equal, but one rather more fully curved than the other. Lateral convexity central and symmetrical (fig. 9 b), making an acute-oval outline.

Smith Coll. (one) no. 53<sub>1</sub>. Railway-cutting, side of Severn, Ironbridge.

10. *Bythocypris acina*, sp. nov.(Pl. VI. figs. 10 *a*, 10 *b*.)

Proportions:—L. 11. H. 7. Th. 5.

Carapace small, nearly ovate, but less convex below than above, and contracted at one end like a grape-stone. Posterior moiety highly arched on the dorsal and postero-dorsal border. The front contracted, so as to project like the small end of a pear. Left valve larger than the other. Edge view oval, with sharp ends.

Smith Coll. (two specimens) no. 52. Railway-cutting, side of Severn, Ironbridge.

11. *Bythocypris phaseolus*, sp. nov.(Pl. VII. figs. 11 *a*, 11 *b*, 12 *a*, 12 *b*.)

	Length.	Height.	Thickness.
Proportions: { Fig. 12 :	17½	10	5½
{ Fig. 11 :	17	9½	7½

Fig. 12 *a* is a short, high, somewhat oblong carapace, arched above, almost straight below, flattish on the sides, and well curved at the nearly equal ends; resembling a kidney-bean. The edge view (fig. 12 *b*) is of a narrow, compressed, subovate outline, with one end much more acute than the other. Fig. 11 *a* is more kidney-shaped than fig. 12 *a*, and 11 *b* is fuller (thicker) than 12 *b*; this may be a sexual if not a varietal feature.

Vine Coll. (six specimens) no. XII. Beds no. 22 and no. 38. Buildwas Beds.

## IV. CYTHERE, Müller, 1785.

Valves unequal (left valve rather larger than the right), oblong-ovate, subreniform, or quadrate. Surface either smooth or variously ornamented. Hinge-line distinct, toothed more or less strongly at its ends.

Excepting in this last particular there are some Silurian Ostracoda which would range among such *Cytheræ* as may have smooth subreniform carapaces, like *Cythere? laganella*, Brady ('Challenger' Ostrac. p. 63, pl. xvi. fig. 7). As the place of the hinge-joints is distinctly shown in some of the specimens before me, it may be allowed that those which have a generally similar aspect and straight hinge-lines should be provisionally placed in this subgroup of the genus; and thus the introduction of a new generic name is avoided. In this category we find:—Pl. VI. figs. 5 and 6, as large forms,

with some variation in shape; Pl. VII. figs. 1 and 5, much alike in outline, but differing in lateral contour; figs. 6 and 14, nearly agreeing in outline and differing very little in contour.

1. *Cythere Hollii*, sp. nov. (Pl. VI. figs. 5 *a*, 5 *b*, 5 *c* (var. *a*), figs. 6 *a*, 6 *b*, 6 *c* (var. *b*).)

	Length.	Height.	Thickness.
Proportions: { Fig. 5 :	46½	23	18
Fig. 6 :	40	23	19

Measurements in 1000ths of an inch :—

Fig. 6 :	66	36	30
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Var. *a*. Large, convex, smooth, ovate-oblong, relatively long, thick and high in the posterior moiety and well-rounded behind; sloping up in the antero-ventral region to the narrower but neatly rounded front. Back straight along hinge-line. Edge view acute and narrow-ovate. End view somewhat obovate, almost round.

This is near *Cythere superba*, Jones and Kirkby, from the Lower Carboniferous strata of Scotland (Ann. & Mag. Nat. Hist. for October 1886, p. 266, pl. ix. fig. 11); but it is longer and narrower.

Two specimens, Smith Coll. no. 81½. Benthall Edge, Ironbridge.

Var. *b* (figs. 6, *a*, *b*, *c*). This is also suboblong and otherwise like var. *a*; but it is relatively shorter, thicker, and higher behind, and less contracted in front. The anterior extremity is symmetrically rounded. The left valve is larger than the right (as in fig. 5), and overlaps to a small extent on the ventral border. Edge view ovate, somewhat compressed.

This is still nearer to *C. superba* in shape than var. *a*; but still it is not identical with it.

It was collected by the late Dr. H. B. Holl, from the Woolhope Limestone of the Malvern Tunnel; and to him the species is here dedicated, with cordial appreciation of his high worth as a geologist and palæontologist.

It is quite possible that these varieties, *a* and *b*, could each claim specific standing; on the other hand, it might be that *C. superba* should be a *variety* with them. For convenience, however, and according to what we know of Palæozoic Cytheridæ, I think it will be best to hold them in the arrangement indicated above.

(Four specimens.) Fig. 6. Collected by Dr. Holl in the Woolhope Limestone, Malvern Tunnel.

Fig. 5. Smith Coll. (one) no. 81<sub>2</sub>. Benthall Edge, Iron-bridge.

Smith Coll. (one) no. 8. Near Much-Wenlock.

2. *Cythere? Vinei*, sp. nov.  
(Pl. VII. figs. 1 *a*, 1 *b*, 5 *a*, 5 *b*.)

	Length.	Height.	Thickness.
Proportions: { Fig. 5 :	20	11	9½
{ Fig. 1 :	18	9	6

Measurements in 1000ths of an inch :—

Fig. 5 . . .	35	18	17
Another (XIII <sub>2</sub> )	33	18	15

Neat, small, ovate-oblong carapaces, with straight back and gentle ventral convexity, especially at the hinder third. Ends rounded, unequal. Edge view more or less compressed-ovate. Fig. 5 *b* has much blunter ends to its contour than fig. 1 *b*; but the latter has been somewhat crushed. This species has a form near to that of *Cytherellina* (*Bythocypris?*) *tersa* (Ann. & Mag. Nat. Hist. ser. 4, vol. iii. p. 217, pl. xiv. fig. 3), but the latter has an arched back.

Mr. Vine's name is connected with this species in recognition of his enthusiastic labour in obtaining the many Ostracoda from the Benthall washings (see vol. xvii. p. 343).

Four specimens :	{	Vine Coll. no. XIII <sub>2</sub> (var.?)	Bed no. 38.
		XIII <sub>3</sub> (fig. 5)	Buildwas Beds.
		LXVI <sub>2</sub> (fig. 1).	Tickwood Beds.
Two specimens :	{	Smith Coll. no. 49.	Benthall Edge, near Ironbridge.
		62 <sub>2</sub> .	Railway-cutting, side of Severn, Ironbridge.

3. *Cythere? subquadrata*, sp. nov.  
(Pl. VII. figs. 6 *a*, 6 *b*, 14 *a*, 14 *b*.)

	Length.	Height.	Thickness.
Proportions: { Fig. 14 :	16½	10	8
{ Fig. 6 :	15	9	6

Carapace high and short, convex, suboblong, with rounded unequal ends; higher and thicker at the hinder third than in front, where it is compressed.

The two specimens figured differ a little in outline and contour, but seem to be within the limits of one species. They remind us of *Cythere? obtusa*, J. & K. (Ann. & Mag.

Nat. Hist. for October 1886, p. 266, pl. ix. fig. 12), in general appearance; but they are not identical with it.

Twelve specimens: {	{	Vine Coll. no. XIII. Bed no. 38. Buildwas Beds.
		LIV <sub>4</sub> (fig. 14) } Bed no. 37.
		LIV <sub>6</sub> (fig. 6) } Buildwas Beds.
		LXIV <sub>8, 9</sub> . Buildwas Beds.

## V. CYTHERELLA, Jones and Bosquet, 1849.

*Cythere, Cytherina, Cytherella, &c.*, auctorum.

In the 'Monograph on Carboniferous Entomostraca,' Palæont. Soc. 1884, by Jones, Kirkby, and Brady, the synonyms of the genus are given in full, and the characters and distribution of the many known species (both fossil and recent) are dealt with.

Carapace oblong or subovate, rarely elongate, compressed, especially in front; valves thick and unequal, the right being much the larger and overlapping the left all round, the two edges being rabbeted together. Surface often smooth, but sometimes pitted, reticulated, or striated. Muscle-spot indicated by a roundish depression near the centre of the valve externally and by a corresponding thickening within.

### 1. *Cytherella Smithii*, sp. nov. (Pl. VII. figs. 15 a, 15 b, 16 a, 16 b.)

	Length.	Height.	Thickness.
Proportions: { Fig. 16 :	12	6½	5
Fig. 15 :	11	6	5

Two specimens measured in 1000ths of an inch :—

{ 24	14	
{ 22	12	10

The little specimens before me belong to the group having smooth valves, subovate or suboblong in outline, and with a more or less cuneiform contour (edge view). Some specimens have the usual central pit on the outside of the valves; some are also constricted across the middle of the smaller valve, and these are narrower (lower) posteriorly than most of the others, with a variable median convexity. May be these are varietal or sexual differences.

Narrow as the limits of difference seem to be at first sight among the very many almost similar forms of *Cytherella*, yet the different proportions of length, breadth, and thickness, with small variations of outline, constitute recognizable distinctions among even the smooth forms. On such

grounds I distinguish this oldest-known form by a separate appellation—*C. Smithii*—after Mr. Smith, of Kilwinning, in whose collection this species is largely represented.

Smith Coll. (six specimens) no. 63. Woolhope.

## VI. PRIMITIA, Jones & Holl, 1865.

(See Ann. & Mag. Nat. Hist. ser. 3, vol. xvi. p. 415,  
and ser. 5, vol. xvii. p. 408, &c.)

### 1. *Primitia punctata*, sp. nov. (Pl. VII. figs. 9 a, 9 b.)

Proportions :—L. 19. H. 10.

Long-oblong carapace, with rounded, nearly equal ends ; rather small, plump, nearly oval in edge view. Surface of valves marked with a faint saddle-shaped depression in the mid-dorsal region, and delicately punctate, especially on the posterior third. On the cast of the interior the impression becomes a deep transverse sulcus, reaching nearly across the valve, and with a width equal to  $\frac{1}{7}$ th of the length of the shell.

*P. punctata* is found in Mr. Smith's no. 67 (four specimens). Railway-cutting near Much-Wenlock ; and Vine Coll. LXV<sub>11</sub> (part) (one specimen). Shales over the Wenlock Limestone. Two also from no. 22. Buildwas Beds.

### 2. *Primitia valida*, J. & H.

(Pl. VI. fig. 7, magnified 50 diam.)

*Primitia valida*, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. (1886), p. 409, pl. xiv. fig. 7.

Proportions :—L.  $22\frac{1}{2}$ . H.  $14\frac{1}{2}$ .

This well-preserved left valve, showing its hinge-line and the rest of its margin of contact, and partially its interior, was at first inadvertently associated with *C. Hollii* (figs. 5 and 6) ; but it is more quadrate and symmetrical and otherwise different. So also it is much more oblong than the analogous interior of *P. umbilicata*, J. & H. (Ann. & Mag. Nat. Hist. ser. 3, vol. xvi. pl. xiii. fig. 2 d).

In the Vine Coll. no. LXIII. Bed no. 25. Tickwood Beds. Altogether there are seventeen specimens of *P. valida* (without the varieties) in the Vine Collection and six in the Smith Collection.

## VII. *Incertæ sedis*. (Pl. VI. figs. 8 a, 8 b.)

Proportions :—L. 19. H. 10. Th. of valve 5 (of carapace 10).

An oval valve with a flexuous, undulate, and broadly bisulcate surface ; and thus somewhat like the *cast* of *Cythe-*

*rellina siliqua* figured in pl. xiv. fig. 6 c, Ann. & Mag. Nat. Hist. ser. 4, vol. iii.

One specimen. Vine Coll. no. XIV<sub>2</sub>. Bed no 43, Coalbrook-Dale Beds.

VIII. NOTE.—Prof. G. Lindström, of Stockholm, has kindly submitted to me for examination a large assortment of Ostracoda from the Silurian Limestones of Scandinavia. With numerous specimens of *Beyrichia* and *Primitia*, and of *Thlipsura v-scripta*, there appear to be some specimens of *Pontocypris Smithii*, *Bythocypris concinna*, and *B. Hollii* (?); also a small representative of *Macrocypris Vinei* (?). He has also found some interesting *Æchminæ* and other rare forms in these limestones.

## IX. EXPLANATION OF THE PLATES.

### PLATE IV.

[All the figures magnified 25 diameters.]

- Fig. 1.* *Macrocypris Vinei*, sp. nov. Cast, imperfect posteriorly. *a*, left valve outwards; *b*, ventral view; *c*, end view.  
*Fig. 2.* The same. Cast, imperfect at hinder end. *a*, right valve shown; *b*, edge view.  
*Fig. 3.* The same. *a*, left valve outwards, slightly imperfect in front; *b*, edge view.  
*Fig. 4.* *Pontocypris Mawii*, sp. nov. *a*, left valve outwards; *b*, right valve outwards; *c*, edge view; *d*, end view.  
*Fig. 5.* *Pontocypris Smithii*, sp. nov. *a*, left valve outwards; *b*, right valve outwards; *c*, ventral view; *d*, dorsal view.  
*Fig. 6.* *Pontocypris Mawii*, sp. nov., var. *gibbera*, nov. *a*, right valve outwards; *b*, edge view; *c*, end view.  
*Fig. 7.* The same. Left valve outwards.

### PLATE V.

[All the figures magnified 25 diameters.]

- Fig. 1.* *Bythocypris Hollii*, sp. nov., ♂. *a*, right valve outwards; *b*, ventral view; *c*, hind view.  
*Fig. 2.* *Bythocypris Hollii*, sp. nov., ♀. Left valve outwards.  
*Fig. 3.* *Bythocypris Phillipsiana*, J. & H., var. *major*, nov. *a*, right valve outwards; *b*, left valve outwards.  
*Fig. 4.* *Bythocypris Phillipsiana*, J. & H. *a*, right valve outwards; *b*, ventral view; *c*, front view.  
*Fig. 5.* *Bythocypris testacella*, sp. nov. *a*, right valve outwards; *b*, ventral view; *c*, end view.  
*Fig. 6.* *Bythocypris concinna*, sp. nov. *a*, left valve outwards; *b*, right valve outwards; *c*, edge view; *d*, end view.  
*Fig. 7.* *Bythocypris concinna*, sp. nov., var. *ovalis*, nov. Right valve outwards.  
*Fig. 8.* *Macrocypris elegans*, sp. nov. *a*, right valve outwards; *b*, ventral view; *c*, hind view.  
*Fig. 9.* *Macrocypris siliquoides*, sp. nov. *a*, right valve outwards; *b*, dorsal view; *c*, front view.  
*Fig. 10.* *Macrocypris?* *alta*, sp. nov. *a*, right valve outwards; *b*, edge view.

## PLATE VI.

[Fig. 7 magnified 50 diam., the others 25 diam.]

- Fig. 1. *Bythocypris*? *reniformis*, sp. nov., ♂. *a*, left valve outwards; *b*, ventral aspect.
- Fig. 2. *Bythocypris*? *reniformis*, sp. nov., var. *a*, left valve shown; *b*, ventral view.
- Fig. 3. *Bythocypris* *Hollii*, sp. nov., ♀. *a*, left valve outwards; *b*, dorsal view.
- Fig. 4. *Bythocypris* *Hollii*?, sp. nov. *a*, left valve (rather crushed); *b*, ventral edge.
- Fig. 5. *Cythere* *Hollii*, sp. nov., var. *a*, or ♂. *a*, left valve shown; *b*, dorsal view; *c*, posterior view.
- Fig. 6. *Cythere* *Hollii*, sp. nov., var. *b*, or ♀. *a*, left valve outwards; *b*, dorsal view; *c*, posterior view.
- Fig. 7. *Primitia* *valida*, J. & H. Interior of left valve (magnified 50 diam.).
- Fig. 8. Incertæ sedis. *a*, right? valve; *b*, edge view.
- Fig. 9. *Bythocypris*? *seminulum*, sp. nov. *a*, right? valve outwards; *b*, edge view.
- Fig. 10. *Bythocypris* *acina*, sp. nov. *a*, left valve outwards; *b*, dorsal view.

## PLATE VII.

[All the figures magnified 25 diameters.]

- Fig. 1. *Cythere*? *Vinei*, sp. nov., ♂. *a*, right valve seen; *b*, edge view.
- Fig. 2. *Bythocypris* *botelloides*?, sp. nov. *a*, right? valve seen; *b*, ventral view.
- Fig. 3. *Bythocypris* *symmetrica*, sp. nov., var. *c*. *a*, left valve seen; *b*, dorsal view.
- Fig. 4. *Bythocypris* *symmetrica*, sp. nov., var. *b*. *a*, left valve seen; *b*, dorsal view.
- Fig. 5. *Cythere*? *Vinei*, sp. nov., ♀. *a*, right valve seen; *b*, dorsal view.
- Fig. 6. *Cythere*? *subquadrata*, sp. nov. *a*, right valve; *b*, edge view.
- Fig. 7. *Bythocypris* *symmetrica*, sp. nov., var. *a*. *a*, right valve outwards; *b*, dorsal view.
- Fig. 8. *Macrocypris* *symmetrica*, sp. nov. *a*, right valve outwards; *b*, dorsal view.
- Fig. 9. *Primitia* *punctata*, sp. nov. *a*, left? valve seen; *b*, edge view.
- Fig. 10. *Macrocypris*? *crassula*, sp. nov. *a*, left valve outwards; *b*, edge view.
- Fig. 11. *Bythocypris* *phaseolus*, sp. nov. *a*, left valve outwards; *b*, dorsal view.
- Fig. 12. The same. *a*, left valve outwards; *b*, ventral view.
- Fig. 13. *Bythocypris* *pustulosa*, sp. nov. *a*, right valve outwards; *b*, ventral view.
- Fig. 14. *Cythere*? *subquadrata*, sp. nov. *a*, right valve; *b*, edge view.
- Fig. 15. *Cytherella* *Smithii*, sp. nov. *a*, left valve outwards; *b*, dorsal view.
- Fig. 16. *Cytherella* *Smithii*, sp. nov., var. *a*, left valve outwards; *b*, dorsal view.





1a



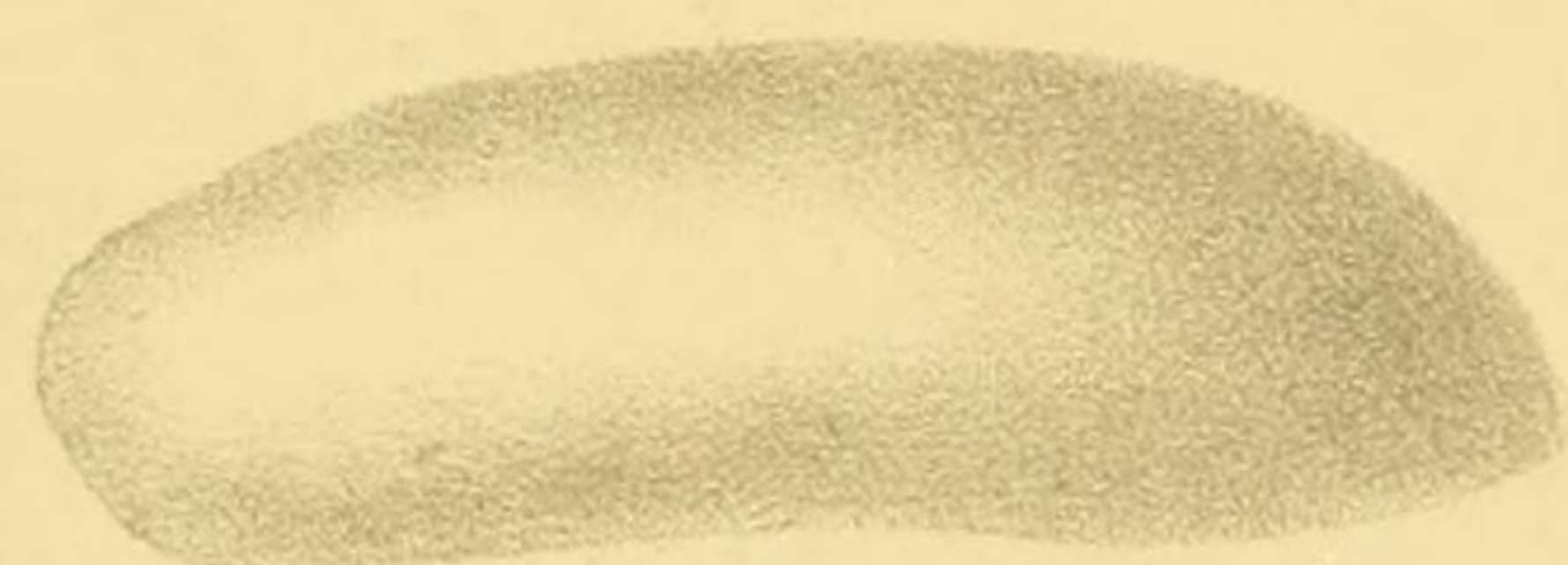
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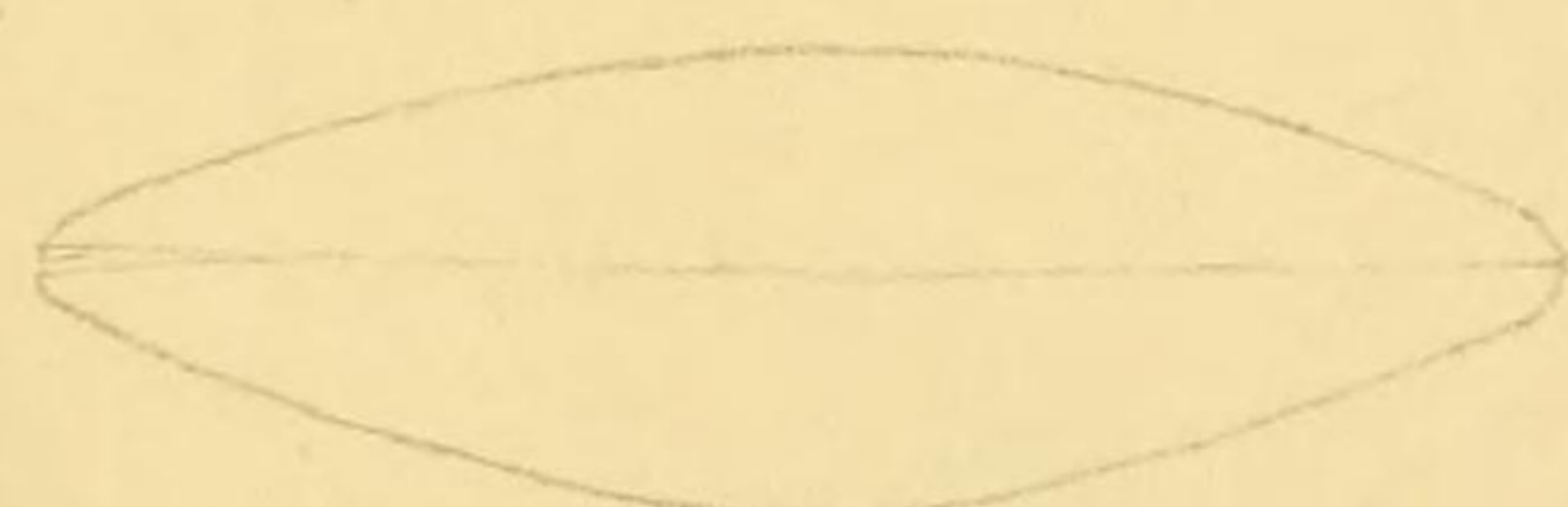
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2b



3a



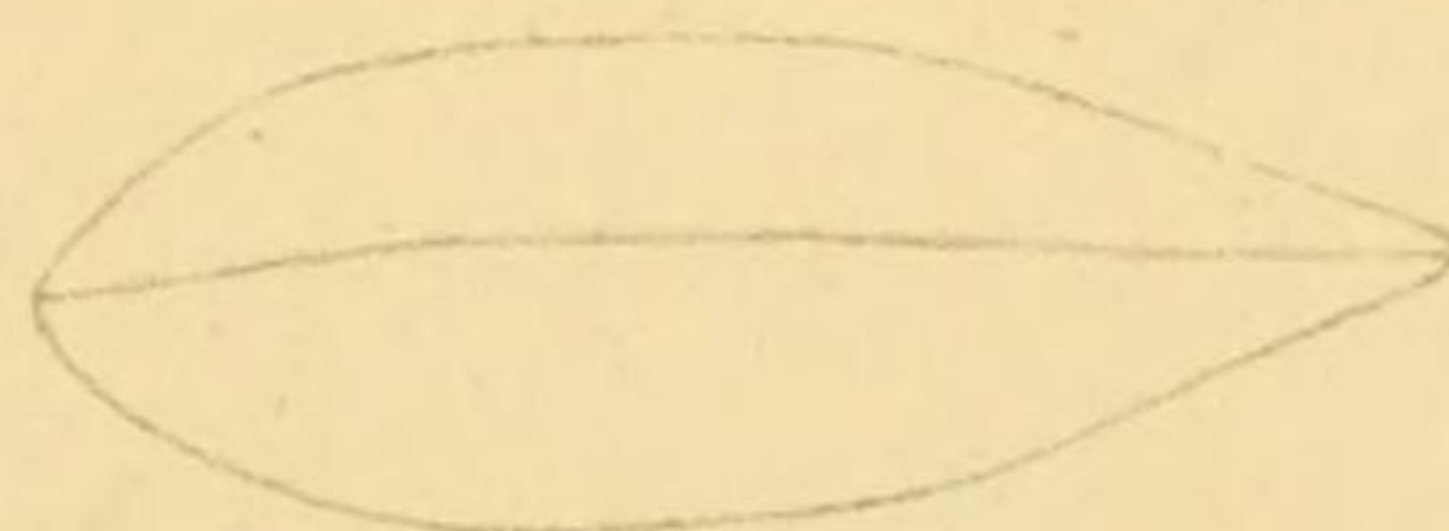
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4a



4b



4c



1c



4d



6c



5a



5b



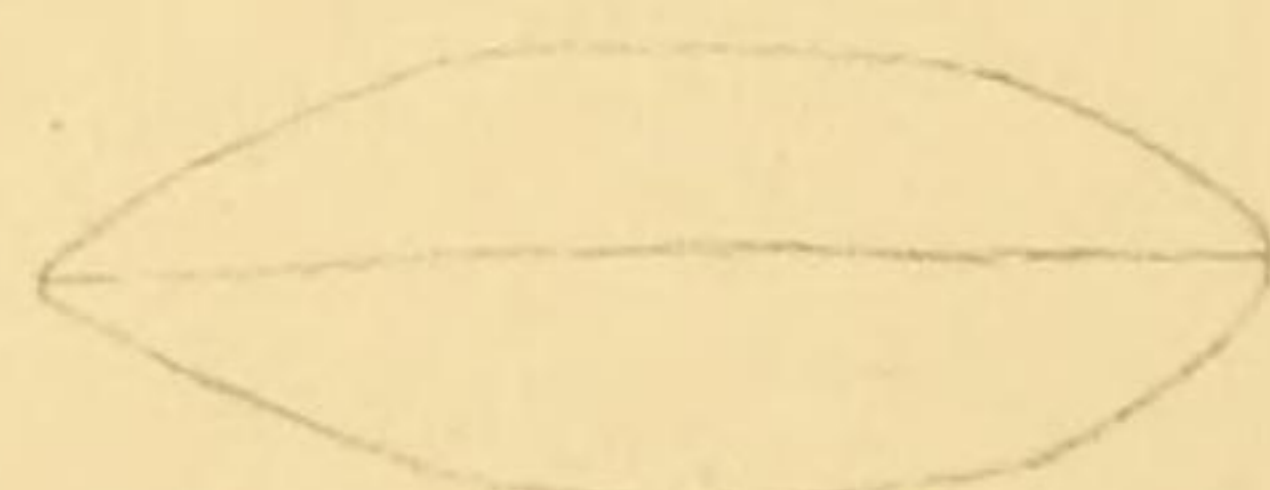
5c



5d



6a



6b



7





1a



2



1b



3a



3b



4a



5a



1c



6d



4c



8c



5c



9c



4b



5b



6a



6b



6c



7



8a



8b



9a



9b



10b



10a

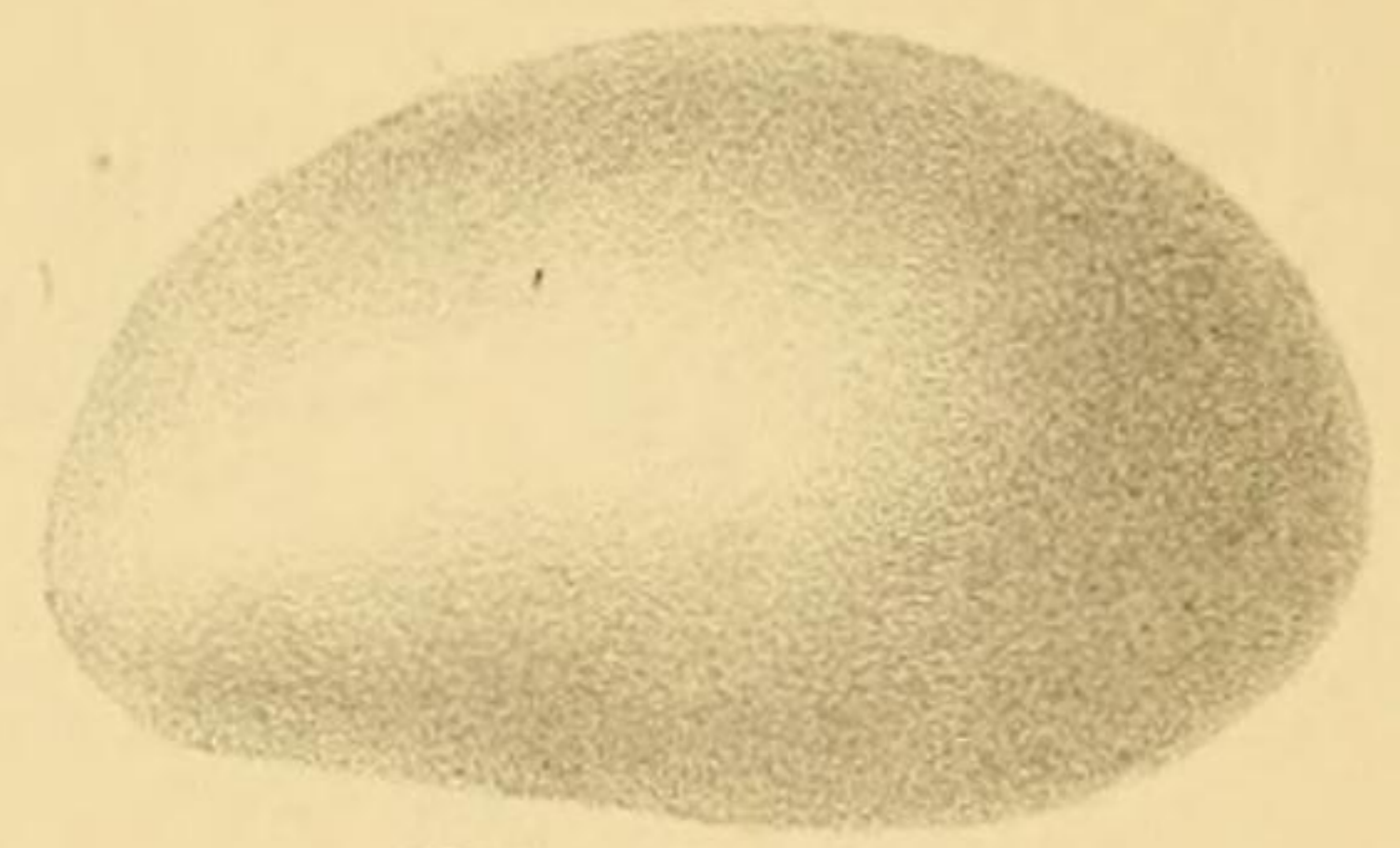




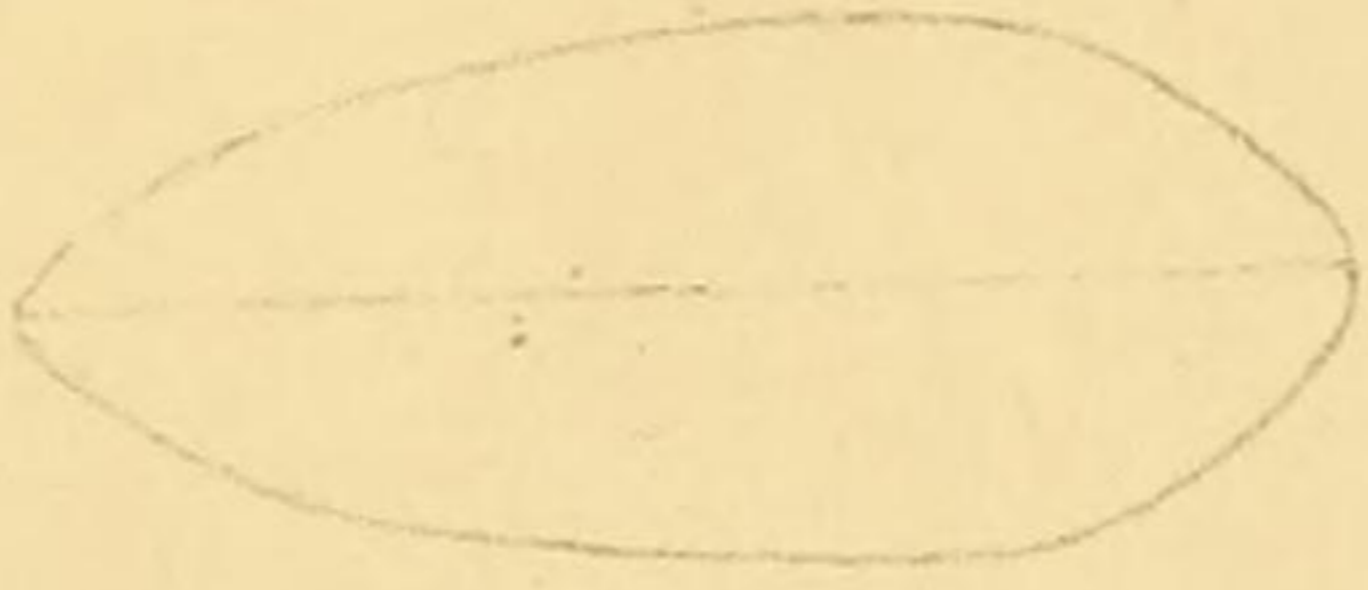
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3a



1b



8b



3b



2a



9a



10a



4a



2b



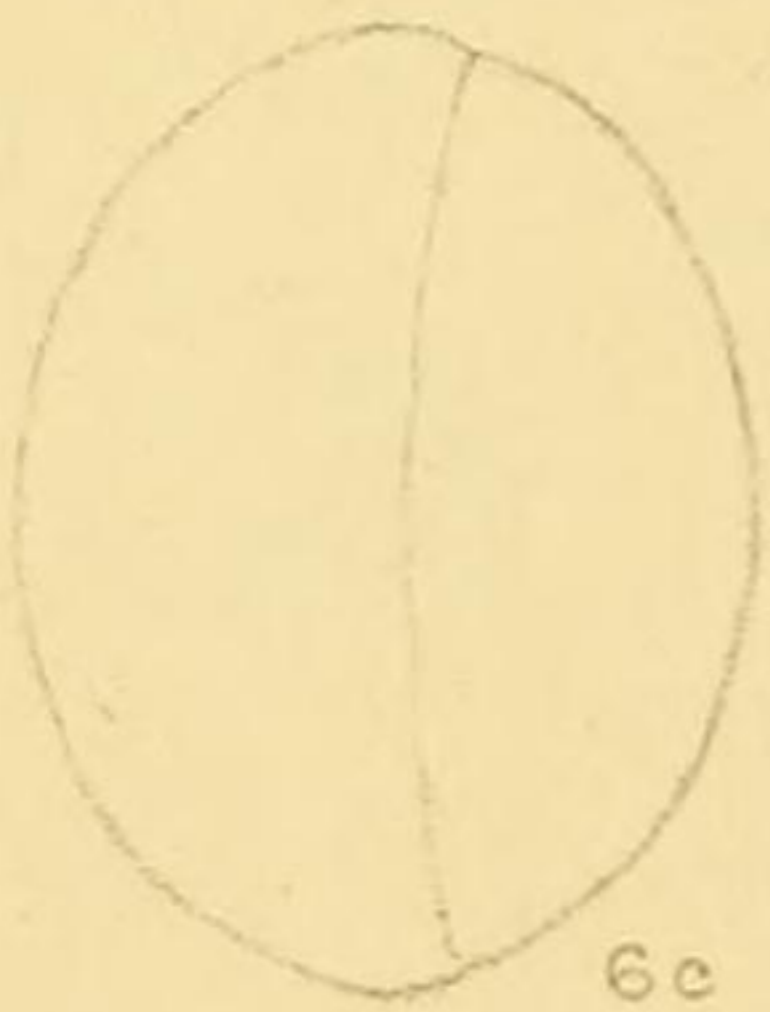
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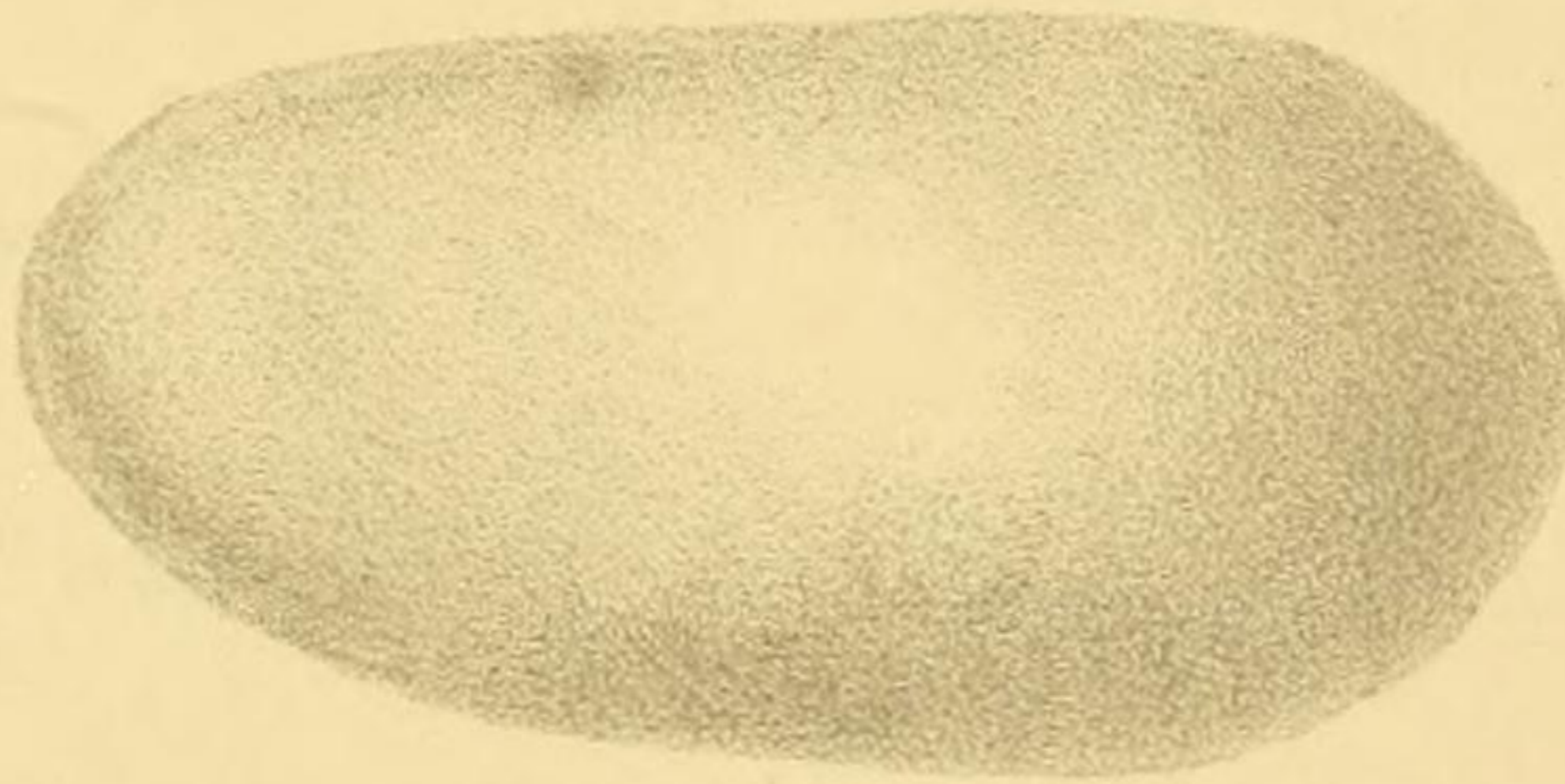
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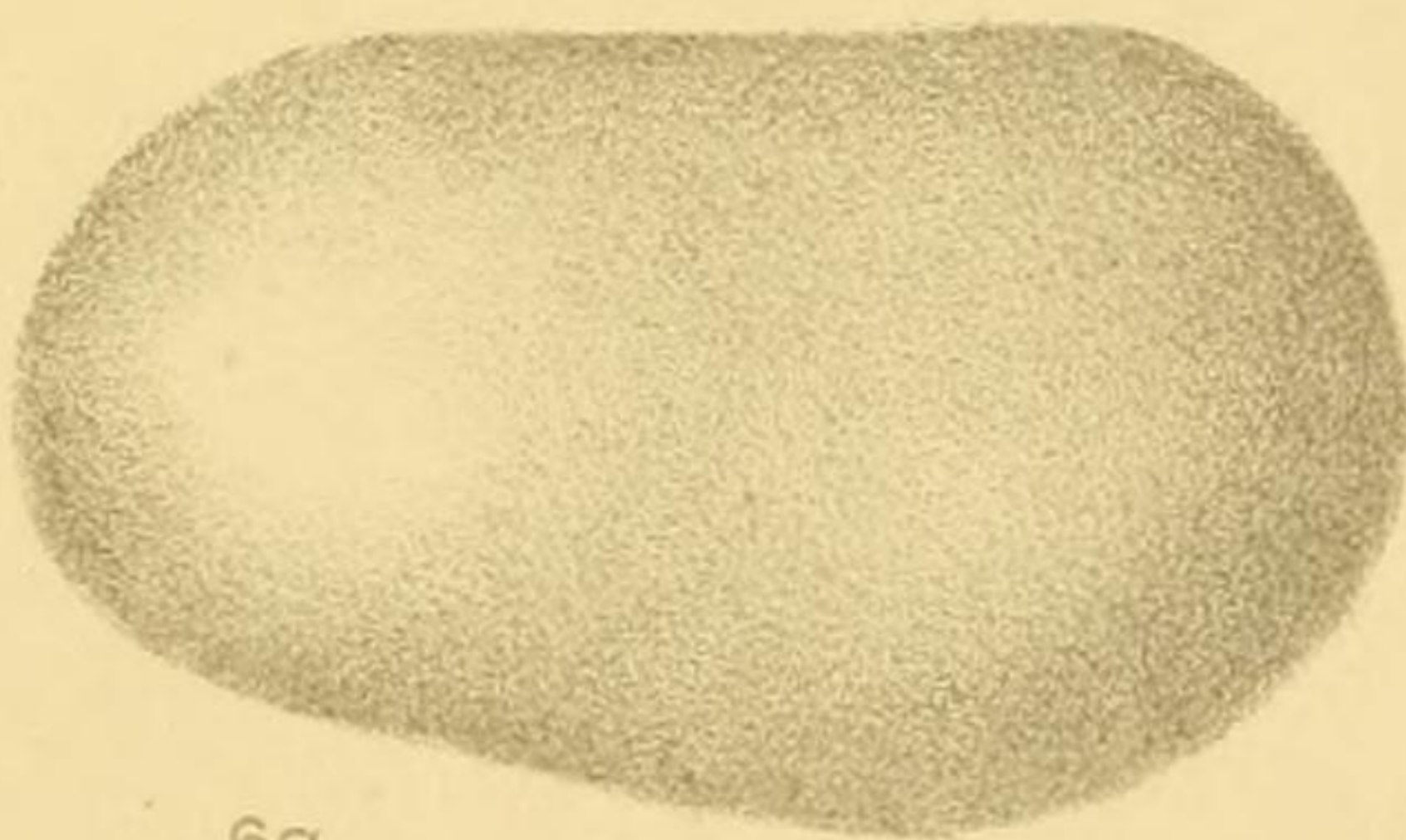
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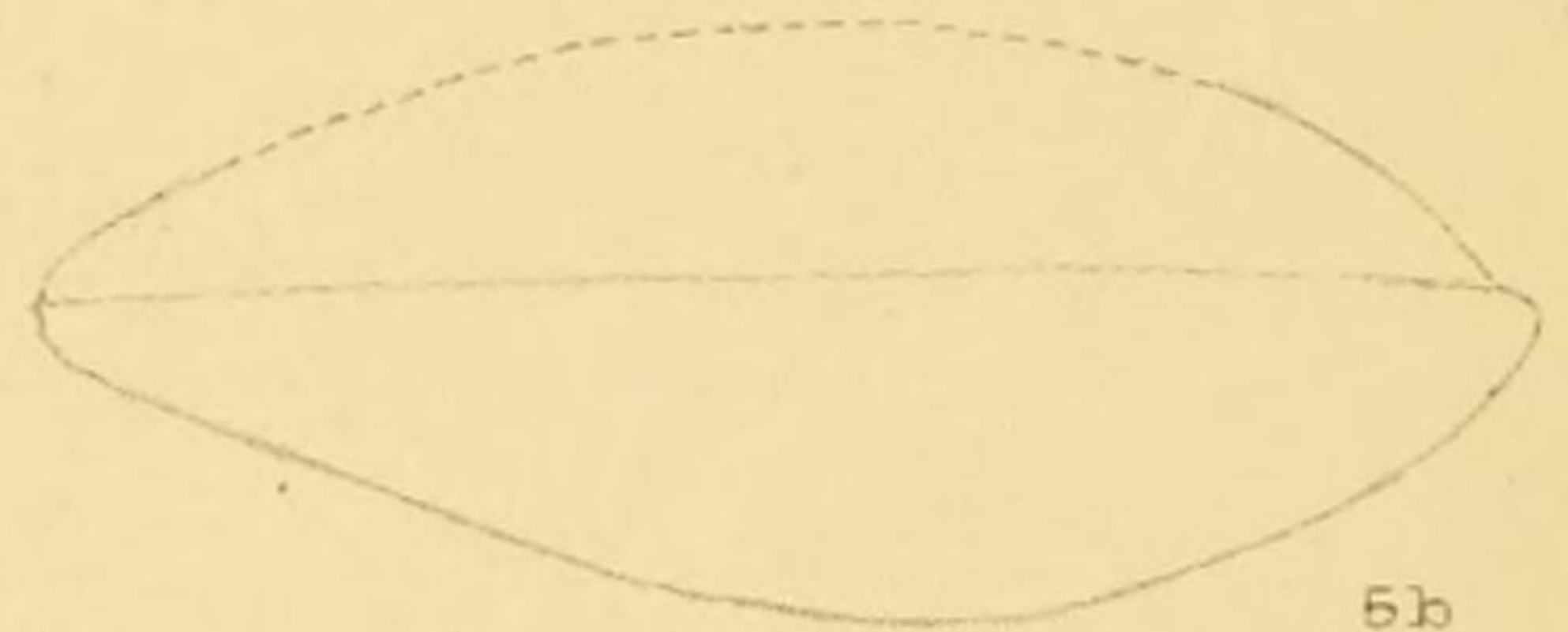
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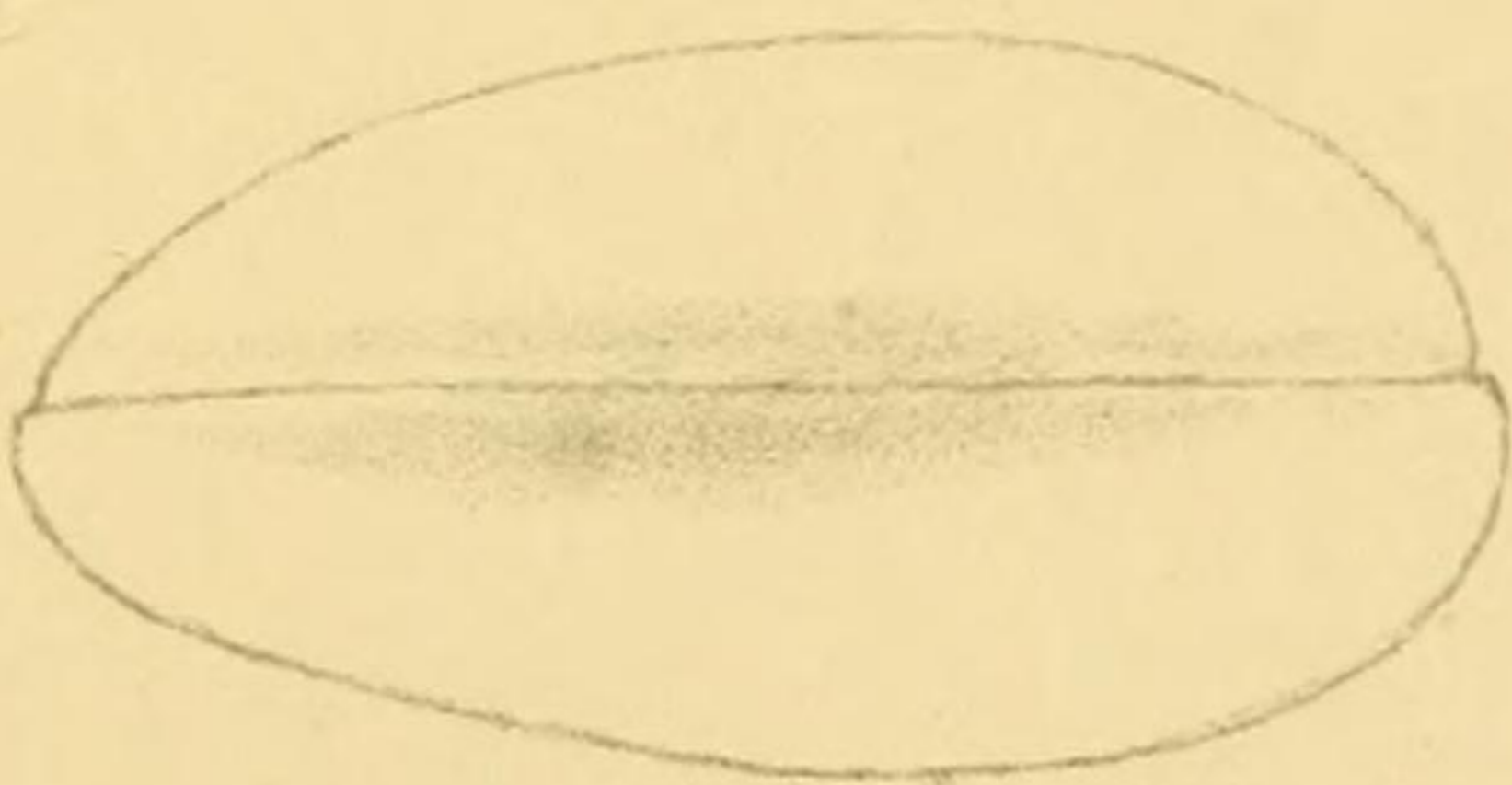
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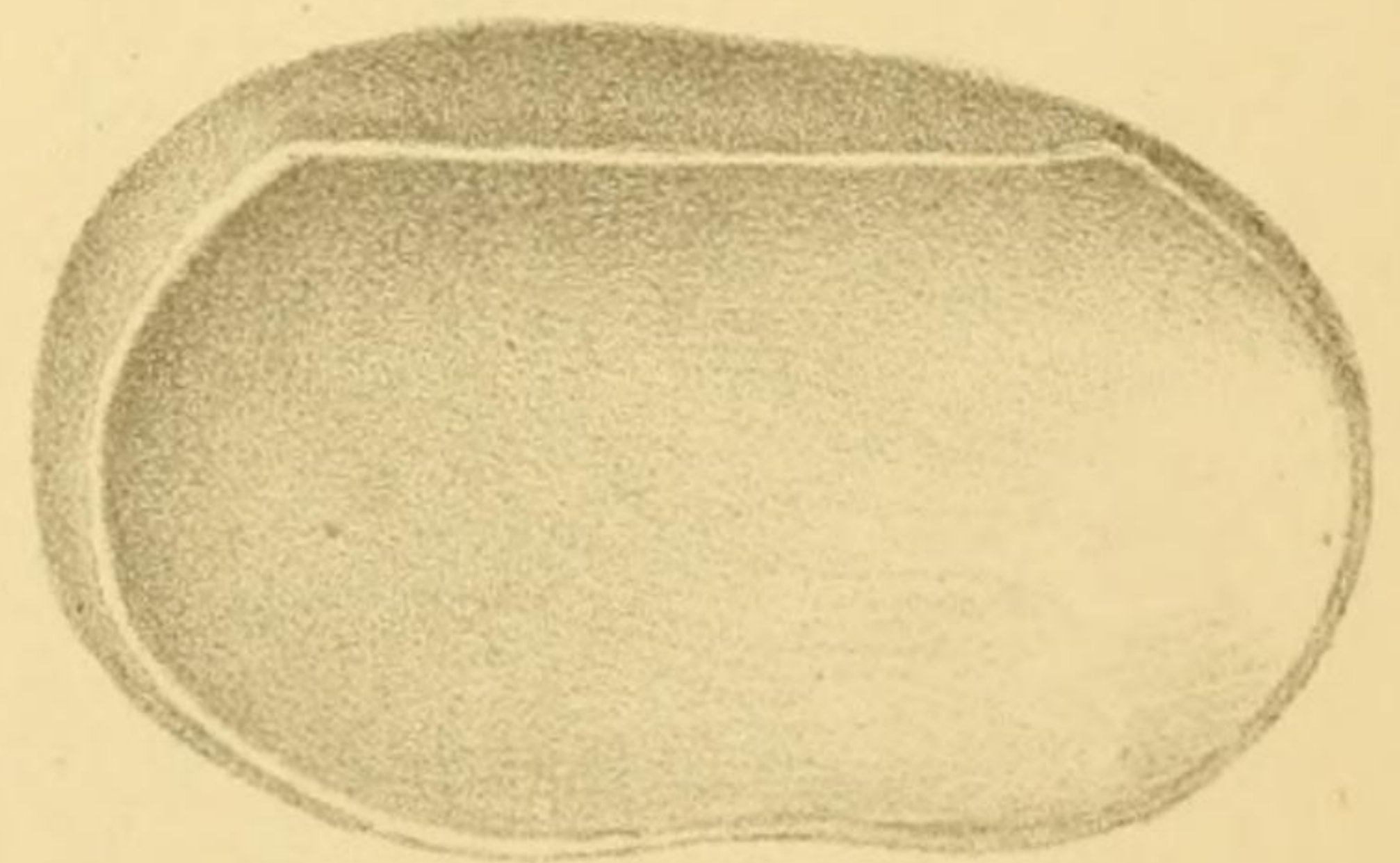
6a



5b



6b



7

E C. Knight lith.

West, Newman & Co. imp.

Silurian Ostracoda.





1a



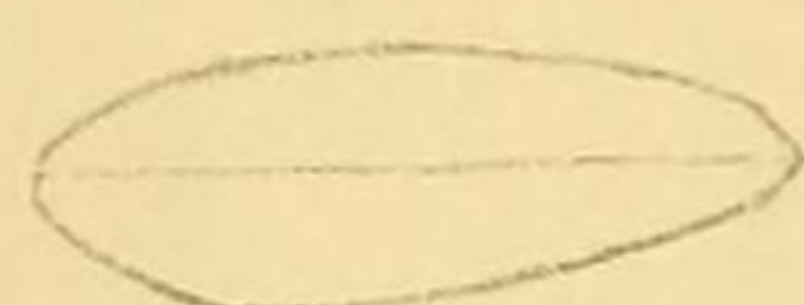
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9a



13a



1b



5b



9b



13b



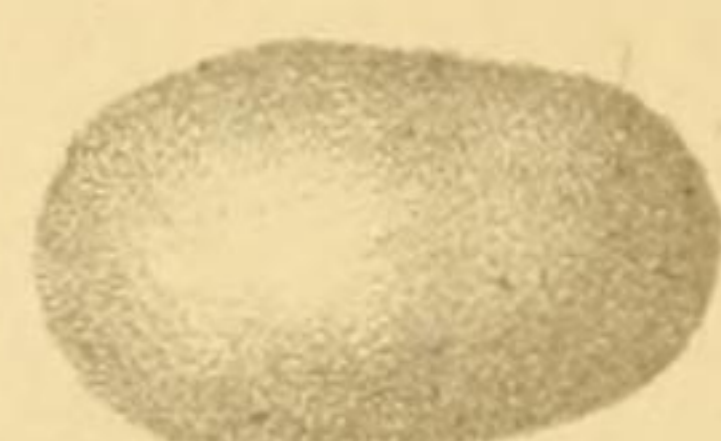
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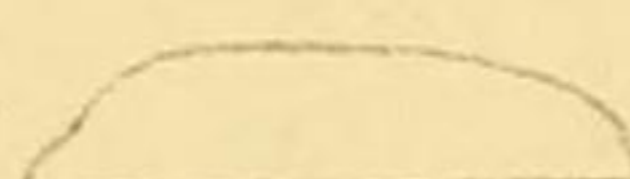
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14a



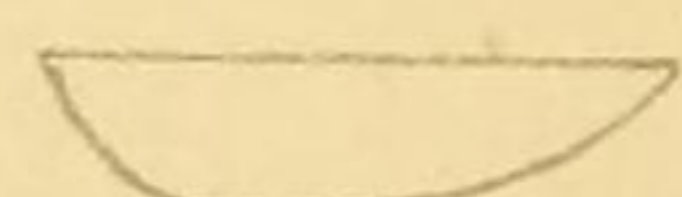
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6b



10b



14b



3a



7a



11a



15a



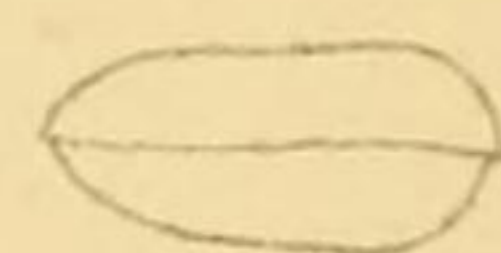
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7b



11b



15b



4a



8a



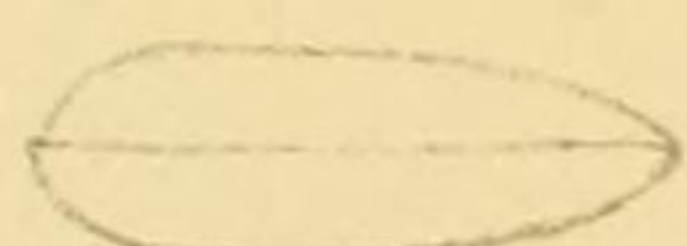
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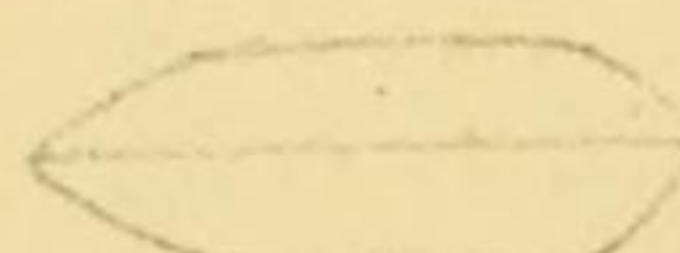
16a



4b



8b



12b



16b