VI.—A TABULAR VIEW OF THE CRETACEOUS POLYZOA OF THE FAMILY IDMONIIDÆ.

By W. D. LANG, M.A., F.Z.S., F.G.S., of the British Museum (Natural History).

IN the GEOLOGICAL MAGAZINE for 1906¹ a key of the published figures of the Cretaceous forms referable to the genus *Entalophora* was offered in the hope that by means of it the difficulties attendant on the determination of the species of this genus might be obviated.

A similar key was prepared for the difficult genus *Retecava*; but in its preparation it was found necessary to overhaul other genera of the family Idmoniidae, a work which resulted in reducing all the genera of this family to a tabular form for the determination of the species. These tables are here given for the use of the collector in determining the forms and as a guide to the descriptions in the British Museum Catalogue.

I. THE GENERA COMPRISING THE IDMONIIDÆ.

The Idmoniidae are defined as Cyclostomata Tubulata in which there is a 'reverse face' of the zoarium without apertures, and those on the 'obverse face' are arranged in rows symmetrically about the middle line.

Like other families of Cretaceous Polyzoa, the Idmoniidae include encrusting and branching forms which pass in regular sequence from strap-shaped zoecia through discoid to erect forms. There is no foliate genus like *Diastopora*² among the Diastoporidæ. The simplest genus, *Idmonea*, resembles forms of *Proboscina* such as *P. radiolitorum* and *P. anomala*; the former, as pointed out by Gregory,³ being intermediate between *Proboscina* and *Idmonea*, thus suggesting the origin of the family.

The following is a tabular view of the genera included in the family :—

IDMONIIDÆ.

A. Zoarium encrusting.

I. Zoarium strap-shaped (like *Proboscina*), or if discoid the zoecia are arranged on strap-shaped ridges; apertures in alternate, pinnately-arranged rows.

a. Apertures in single lateral series *Idmonea*.

b. Apertures in double lateral series (except at extreme proximal end) *Reptofascigera*.

(Only species, *R. alternata*, d'Orbigny, 1853: Pal. Franç. Bry. Crét., pl. 744, figs. 4-6.)

II. Zoarium discoid (like *Berenicea*); zoecia in radially-arranged rows *Phalangella*.

(Only Cretaceous species, *Berenicea radians*, Novak, 1877, Bry. Böhm. Kr.: Denk. Ak. Wiss. Wien., vol. xxxvii, pt. 2, pl. iv, figs. 15-18.)

B. Zoarium erect, of hollow branches *Semiclausia*.

¹ W. D. Lang, "A Key to the Published Figures of the Cretaceous Forms of *Entalophora*": GEOL. MAG., 1906, p. 462.

² Cf. a similar case in the Eleidæ: see Lang, GEOL. MAG., 1906, p. 60.

³ J. W. Gregory: Brit. Mus. Cat. of Cretaceous Bryozoa, vol. i (1899), p. 150.

C. *Zoarium erect, of solid branches.*

I. No unpaired median nor multiple median series of apertures.

a. Apertures in double lateral series *Bitubigera*.

(Only Cretaceous species, *B. compressa*, Marsson, 1887,
Bry. Rüg. : Pal. Abh., vol. iv, pl. iii, fig. 1.)

b. Apertures in single lateral series.

1. Apertures circular or tear-shaped. In the former case longitudinal grooves, slots, or circular depressions are present on the zoarium; in the latter case the reverse face is very narrow.

a. Zoarium very compressed in a plane at right angles to that of the obverse and reverse faces; reverse face well developed *Bicrisina*.

β. Zoarium not very compressed; reverse face very narrow *Sulcocava*.

2. Apertures circular (tear-shaped in two species of *Retecava*, but in both the reverse face is well developed). If longitudinal grooves or depressions are present on the zoarium, it is never very compressed in a plane at right angles to that of the obverse and reverse faces (as in *Bicrisina*), nor is the reverse face reduced (as in *Sulcocava*).

a. Branches very compressed in a plane at right angles to that of the obverse and reverse faces; or if not so compressed the reverse face is very narrow *Reticrisina*.

β. Branches cylindrical or moderately compressed; reverse face well developed.

a. An 'axial rod' more or less developed on the reverse side *Retecava*.

b. No 'axial rod' *Crisina*.

II. An unpaired median series of apertures; lateral series simple *Tervia*.

III. A multiple median series of apertures; lateral series multiple *Pergensella*.
(Only species—

Idmonea geniculata, von Hagenow, 1851: Bry. Maastr.
Kr., pl. iii, fig. 5.

Retepora clathrata, pars, Goldfuss, 1827: Petrefact.
Germ., vol. i, pl. ix, figs. 12e-f.

Pergensella geniculata, Gregory, 1899: Brit. Mus. Cat.
Cret. Polyzoa, p. 210, figs. 19-20.)

Until the forms consisting of solid branches are reached, the development of the family appears fairly simple. The genus *Semicleusa*, consisting of hollow tubes, probably arose, like the hollow *Diastoporas* (such as *D. ramosissima*, d'Orbigny), by the folding of an erect unilamellar zoarium. Such a form has not yet been found; but it only needs the erection of the distal end of an *Idmonea* to produce it. Until the proximal ends of d'Orbigny's two species of *Semicleusa* are found nothing definite can be known of their origin. For it is conceivable that they may be encrusting forms which have grown on some perishable cylindrical base, such as a stem of seaweed, the decomposition of which has left the encrusting Polyzoan in the form of a hollow tube.

Gregory has produced evidence of the origin of *Crisina* in the shape of a discoid base of this genus resembling *Phalangella*.¹ This is exactly comparable with the specimen he figures of an *Entalophora* arising directly from a *Berenicea*-like base.²

The origin of *Reptofascigera* from *Idmonea* is clearly shown in

¹ J. W. Gregory: Brit. Mus. Cat. Cret. Bryozoa, vol. i (1899), p. 159, fig. 11.

² J. W. Gregory: loc. cit., p. 217, fig. 26.

d'Orbigny's figure of the only species of that genus. At the extreme proximal end of the zoarium the apertures are in single lateral series, i.e. proximally the form is an *Idmonea*.

Without the knowledge of the proximal end of *Bitubigera* it is uncertain whether this form arose directly from *Crisina*, as *Reptofascigera* from *Idmonea*, by doubling the single lateral series of apertures, or through intermediate unknown forms from *Reptofascigera*.

The following diagram summarizes these suggestions as to the origin of the simpler genera:—

The forms distributed among the remaining genera are not easy to group. *Tervia*, *Retierisina*, and *Crisina* (restricted) are considered by Gregory as subgenera of *Crisina*; and there is no doubt of their close relationship. But the species of *Crisina* and of *Retecava* are very hard to separate, and the latter genus resembles *Sulcocava* and *Bicrisina*. *Pergensella* is very isolated, and there is no evidence of its origin.

The following scheme suggests the main lines of development, but it does not represent all the facts, for species of intermediate nature occur between various genera, showing that probably the genera are artificial. Hence the clumsy definitions in the table of genera given above.

II. THE SUBDIVISIONS OF THE GENERA.

In the following tables for the subdivision of the genera references are given only to those forms which are figured; for it is often almost impossible to be sure of the species intended by descriptions unaccompanied by figures, in the case of these obscure forms. But as these tables are not intended to show natural relationships, but only as keys to help the collector to determine the forms described in the British Museum Catalogue, the synonymy of the species is assumed to be that given in the Catalogue. The remarks prefacing the table of the genus *Entalophora* in the former paper are applicable here. The genera *Crisina* and *Retecava* are taken together, owing to the difficulty of separating them in practice. Theoretically a solid rod-like thickening occupies the reverse side of the zoarium in *Retecava*; while that of *Crisina* is not wider than the obverse side. But forms of *Retecava* occur, such as *R. cypris* (d'Orbigny) and *R. grandis* (d'Orbigny), in which the 'axial rod' is reduced or hardly distinguishable; while in *Crisina ligeriensis*, d'Orbigny, the reverse side is decidedly rod-like. The morphological significance of the 'axial rod' stands or falls with that of the 'canaux de renforcement' of Pergens,¹ structures which can only be identified in longitudinal sections.

IDMONEA.

- I. Zoarium of one or two (connected only at their proximal ends) strap-shaped zoecium-bearing ridges, each of which may have its own 'selvage.'
 - A. Zoarium long and narrow (about six times as long as broad), with or without a 'selvage.'
 - a. Zoecia emergent.

Reptotubigera cristata, Meunier & Pergens, 1885, Nouv. Bry. Crét. Sup. : Mém. Soc. Roy. Malac. Belge, pl. ii, fig. 7.

Idmonea cristata, Gregory, 1899 : Brit. Mus. Cat. Cret. Bry., vol. i, pl. viii, figs. 4a, 4b.
 - b. Zoecia immersed.

Idmonea alipes, Gregory, 1899 : Brit. Mus. Cat. Cret. Bry., vol. i, pl. viii, figs. 2, 3.
 - B. Zoarium short (about three times as long as broad), rapidly becoming broader distally, without a 'selvage.'

Idmonea virgula, d'Orbigny, 1851 : Bry. Crét., pl. 631, figs. 15-17.

Reptotubigera simplex, de Loriol, 1853 : Invert. Mt. Salève, pl. xvi, fig. 3.
- II. Zoarium of many zoecium-bearing ridges, rising from a common 'selvage.'
 - A. Ridges short (seldom more than three times, generally about twice as long as broad) and straight.
 - a. Two to three zoecia in a lateral series.

Reptoclausula neocomiensis, de Loriol, 1863 : Invert. Mt. Salève, pl. xvii, fig. 7.
 - b. Three or four zoecia in a lateral series.

Reptoclausula obliqua, d'Orbigny, 1853 : Bry. Crét., pl. 765, figs. 3, 4.
 - c. Five or six zoecia in a lateral series.

Reptoclausula neocomiensis, d'Orbigny, 1853 : Bry. Crét., pl. 765, figs. 1, 2.

¹ Pergens, 1890, "Revision des Bryozoaires du Crétacé," p. 311; and J. W. Gregory, 1899, Brit. Mus. Cat. Cret. Bry., vol. i, p. 149.

- B. Ridges long (six or more times as long as broad) and often wavy.
 a. Four to six zoëcia in the breadth of a ridge.
Lopholepis Hagenowii, Sharpe, 1854: Quart. Journ. Geol. Soc.,
 pl. v, fig. 7.
Idmonea Hagenowii, Gregory, 1899: Brit. Mus. Cat. Cret. Bry.,
 pl. viii, figs. 1a, b.
 b. Five to seven zoëcia in the breadth of a ridge.
Reptoclausia meandrina, de Loriol, 1868, Val. Arz.: Pal. Suisse,
 ser. iv, pt. 2, pl. vi, fig. 1.

SEMICLAUSA.

- A. Zoarium a flattened tube; zoëcium-bearing ridges arranged pinnately.
Semiclausia alternata, d'Orbigny, 1853: Bry. Crét., pl. 764,
 figs. 6-10.
 B. Zoarium a tube, triangular in cross-section; zoëcium-bearing ridges arranged in
 longitudinal rows.
Semiclausia angulosa, d'Orbigny, 1853: Bry. Crét., pl. 764,
 figs. 11-13.

BICRISINA.

- A. Depressions between the apertures circular; apertures about twelve to fifteen in
 a series; reverse face occupies about half the zoarium.
Bicrisina Gaudryi, Pergens, 1890: Revision, pl. xiii, fig. 2.
 B. Depressions between the apertures tear-shaped; apertures about eight in a series;
 reverse face not so extensive as in *B. Gaudryi*.
Reticulipora cultrata, d'Orbigny: 1851, Bry. Crét., pl. 611,
 figs. 6-10; 1853, Bry. Crét., pl. 768, figs. 11-15.

SULCOCAVA.

- A. Apertures circular.
 I. Zoarium strongly fluted.
 a. Distance between apertures of the same series about one diameter of an
 aperture. Reverse face almost obliterated.
Sulcocava sulcata, d'Orbigny, 1853: Bry. Crét., pl. 789, figs. 1-3.
 b. Distance between apertures of the same series less than one diameter of
 an aperture. Reverse face fairly developed.
Sulcocava costulata, Marsson, 1887, Bry. Rüg.: Pal. Abh.,
 vol. iv, pt. 1, pl. ii, fig. 1.
 II. Zoarium with slot-shaped depressions between the apertures
Sulcocava cristata, Gregory, 1899: B.M. Cat. Cret. Bry., vol. i,
 p. 212, fig. 21.
Sulcocava gracilis, Gregory, 1899: B.M. Cat. Cret. Bry., vol. i,
 p. 214, fig. 23.
 III. Zoarium with faint longitudinal depressions between the apertures.
Laterocava gracilis, d'Orbigny, 1853: Bry. Crét., pl. 789,
 figs. 17-20.
 B. Apertures tear-shaped.
 I. Apertures about eight in a series.
Sulcocava cristata, d'Orbigny, 1853: Bry. Crét., pl. 789, figs. 4-8.
Sulcocava lacryma, d'Orbigny, 1853: Bry. Crét., pl. 789, figs. 9-12.
 II. Apertures about twelve in a series.
Laterocava rustica, d'Orbigny, 1853: Bry. Crét., pl. 789,
 figs. 13-16.

RETICRISINA.

- A. Branches of zoarium form a regular, dense network, the meshes of which are
 hexagons or squares.
Reticulipora ligeriensis, d'Orbigny, 1851: Bry. Crét., pl. 609,
 figs. 1-6.
Reticulipora girondina, d'Orbigny, 1851: Bry. Crét., pl. 609,
 figs. 7-12.

B. Branches of zoarium, if anastomosing, form only a loose network, the meshes of which are flame-shaped.

I. Zoarium very compressed in a plane at right angles to that of the obverse and reverse faces, being about five or six times as high as wide.

a. Apertures about seven in a series.

Reticulipora papyracea, d'Orbigny: 1851, Bry. Crét., pl. 611, figs. 1-5; 1853, Bry. Crét., pl. 768, figs. 3-10.

Reticulipora complanata, Marsson, 1887, Bry. Rüg.: Pal. Abh., vol. iv, pl. iii, fig. 10.

Retierisina papyracea, Gregory, 1899: B.M. Cat. Cret. Bry., vol. i, pl. ix, figs. 1-3.

b. Apertures twelve to twenty in a series.

Reticulipora obliqua, d'Orbigny: 1851, Bry. Crét., pl. 610, figs. 1-5; 1853, Bry. Crét., pl. 768, figs. 1, 2.

Retierisina obliqua, Gregory, 1899: B.M. Cat. Cret. Bry., vol. i, p. 177, fig. 13; pl. viii, figs. 8, 9.

II. Zoarium compressed in a plane at right angles to that of the obverse and reverse faces, but only three or four times as high as wide. Apertures about nine in a series.

Cricopora gradata, Leymerie, 1851, Type. Pyren. par. à Craie: Mém. Soc. géol. France, ser. II, vol. iv, pl. ix, fig. 7.

III. Zoarium only slightly, if at all, compressed in a plane at right angles to that of the obverse and reverse faces.

Retepora disticha, pars, Goldfuss, 1827: Petref. Germ., vol. i, pl. ix, figs. 15c, d.

Idmonea disticha, von Hagenow, 1851: Bry. Maastr. kr., pl. ii, fig. 8.

Idmonea maculata, pars, von Hagenow, 1851: Bry. Maastr. kr., pl. ii, figs. 3e-g.

Tubigera disticha, d'Orbigny, 1853: Bry. Crét., pl. 746, figs. 2-6.

Ceriopora subcompressa, von Hagenow, 1845: in Geinitz, Grundr. Verst., pl. xxiii b, fig. 15.

Idmonea subcompressa, Marsson, 1887, Bry. Rüg.: Pal. Abh., vol. iv, pl. ii, fig. 7.

Stichopora regularis, d'Orbigny, 1851: Bry. Crét., pl. 613, figs. 11-15.

Tubigera antiqua, d'Orbigny, 1853: Bry. Crét., pl. 746, fig. 1.

Tubigera distans, d'Orbigny, 1853: Bry. Crét., pl. 746, figs. 7-11.

Retierisina disticha, Gregory, 1899: B.M. Cat. Cret. Bry., vol. i, p. 184, fig. 14.

TERVIA.

A. Zoëcia one or two in a lateral series.

1. Distance between the series of apertures two to three times the diameter of an aperture; zoarium cylindrical; zoëcia immersed; distance between apertures of the same series one diameter of an aperture.

Crisina subgracilis, d'Orbigny, 1851: Bry. Crét., pl. 614, figs. 6-10.

2. Distance between the series of apertures four times the diameter of an aperture; zoarium flattened in the plane of the obverse and reverse faces; zoëcia immersed; distance between apertures of the same series one diameter of an aperture.

Filioparsa pulchella, Marsson, 1887, Bry. Rüg.: Pal. Abh., vol. iv, pl. iii, fig. 7.

3. Distance between the series of apertures four to seven times the diameter of an aperture.

a. Apertures one only in a series; zoarium flattened in the plane of the obverse and reverse faces; zoëcia immersed or boundaries slightly shown.

T. subgracilis.

- Filisparsa simplex*, von Reuss, 1874, Bry. ob. Plän.:
Paleontogr., vol. xx, pt. 2, pl. xxv, fig. 1. } *T. muelleri*.
- b. Apertures one to two in a series; zoarium cylindrical; zoecia immersed, or boundaries shown, or slightly emergent; apertures of the same series distant half a diameter of an aperture.
Idmonaea muelleri, Beissel, 1865, Bry. Aach. kr.: Nat. Verh. Holl. Maat. Wet., ser. II, vol. xxii, p. 77, pl. ix, figs. 105-106. } *T. muelleri*.
- Filisparsa muelleri*, Beissel, 1865: op. cit., pl. x, figs. 129-131. }
- B. Zoecia alternately two and three in a lateral series; zoarium flat on the reverse side, triangular in section; zoecia immersed, with boundaries shown; zoecia of same series distant two to three diameters of an aperture, those of different series four to five diameters of an aperture.
Idmonaea decurrens, Poeta, 1892, Mech. koryc. Hory.: Ceska. Ak. Fr. Jos. Praze, sect. 2, pl. ii, figs. 3-6. } *T. decurrens*.
- C. Zoecia three to four in a lateral series.
1. Zoarium clavate; zoecia immersed; zoecia of same series distant one to two diameters, and those of different series four to five diameters of aperture.
Clavitubigera depressa, d'Orbigny, 1853: Bry. Crét., pl. 747, figs. 1-5. } *T. sub-gracilis*.
2. Zoarium compressed in a plane at right angles to that of the obverse and reverse faces; zoecia immersed, but their boundaries are well marked; zoecia of the same series distant one to one and a half times, those of different series three to four times, the diameter of an aperture.
Tervia Gamblei, Gregory, 1899: B.M. Cat. Cret. Bry., vol. i, pl. ix, fig. 9. } *T. Gamblei*.
3. Zoarium cylindrical or flattened in a plane parallel to that of the obverse and reverse faces.
- a. Zoarium with 'dorsal processes' without apertures projecting from the reverse face; zoarium cylindrical, but reverse face is flat; zoecia immersed, with boundaries very slightly shown; zoecia of the same series distant one-half, those of different series three to four times, the diameter of an aperture.
Tervia gibbera, Gregory, 1899: B.M. Cat. Cret. Bry., vol. i, p. 174, fig. 12. } *T. gibbera*.
- b. Zoarium without 'dorsal processes.'
- a. Distance between the different series of apertures one and a half to two and a half times the diameter of an aperture; zoarium flattened in a plane parallel to obverse and reverse faces; reverse face flat or slightly concave; zoecia immersed, but boundaries may be prominent. Apertures of same series distant one-quarter to one diameter of an aperture.
Idmonaea dorsata, von Hagenow, 1851: Bry. Maastr. kr., pl. ii, fig. 10. } *T. dorsata*.
- Idmonaea dorsata*, d'Orbigny, 1853: Bry. Crét., pl. 748, figs. 16-19. }
- Idmonaea dorsata*,¹ Pergens, 1890: Revision, pl. xii, fig. 5. }
- B. Distance between the different series of apertures three diameters of an aperture.
1. Distance between apertures of the same series one and a half to two diameters of an aperture; zoarium flattened in a plane parallel to that of the obverse and reverse faces; zoecia immersed, boundaries not shown or hardly shown.
Idmonaea dorsata, var. *Faxeensis*, Pergens & Meunier, 1887, Bry. gar. Faxe: Ann. Soc. Roy. Malac. Belge, vol. xxi, pl. xi, fig. 1. }
2. Distance between apertures of the same series one-half the diameter of an aperture; zoarium cylindrical, zoecia immersed.
Retepora disticha, pars, Goldfuss, 1827: Petref. Germ., vol. i, pl. ix, figs. 15g, h. }

¹ Most of the characters of *I. dorsata* are not shown on Pergens' figure. There are remains of what might have been 'dorsal processes.'

CRISINA—RETECAVA.

- A. Zoarium cylindrical or subtriangular or subquadrangular in cross-section, or flattened in a plane at right angles to the obverse and reverse faces.
 - I. Lateral series quite irregular.
 - a. Zoarium with a strong, blunt median keel 1
 - b. Zoarium with a strong, thin median keel 2
 - II. A few scattered apertures between the somewhat wavy lateral series ... 3
 - III. Lateral series regular.
 - a. Apertures elongate in a proximal-distal direction.
 1. Apertures about four in a series 4
 2. Apertures ten or more in a series 5
 - b. Apertures circular or nearly so.
 1. Reverse face convex.
 - a. Apertures one or occasionally two in a series 6
 - β. Apertures 2-6 in a series.
 - a. No decided keel on the obverse face, nor much compressed.
 1. Apertures decreasing in size from the middle of the obverse face outwards 7
 2. Apertures all of one size.
 - a. Zoœcia immersed and boundaries to zoœcia not strongly marked.
 - a. Series of apertures do not reach the middle line of obverse face.
 1. Branches connected by cross-bars which bear no apertures 8
 2. Branches with no cross-bars.
 - a. Distance between series of apertures 5-8 or more times the diameter of aperture.
 - a. Apertures two in a series, branches take a zigzag course 9
 - b. Apertures 3-4 in a series; those of same series distant about half diameter of aperture ... 10
 - c. Apertures 4-5 in a series; those of same series distant three-quarters diameter of aperture ... 11
 - β. Distance between series of apertures 2-3 diameters of apertures 12
 - b. Series of apertures meet the middle line.
 1. Apertures of same series distant less than one diameter of aperture.
 - a. Apertures of different series distant 1-3 diameters of aperture 13
 - β. Apertures of different series distant about three diameters of aperture 14
 - γ. Apertures of different series distant 4-8 diameters of aperture 15
 2. Apertures of same series distant one diameter of aperture 16
 - β. Zoœcia immersed, but boundaries of zoœcia are strongly marked.
 1. Zoœcia two only in a series 17
 2. Zoœcia three (occasionally two) in a series 18
 3. Zoœcia four in a series 19
 4. Zoœcia six in a series (series of apertures do not reach the middle line) 20
 - γ. Zoœcia emergent 21
 - b. A decided keel on obverse face or decidedly compressed.
 1. Apertures of same series distant one or more than one diameter of aperture.
 - a. Reverse face marked with linear depressions 22
 - β. Reverse face marked with reticular depressions 23
 2. Apertures of same series distant less than one diameter of aperture.

- a. Apertures of different series distant 3-6 diameters of aperture 24
 β. Apertures of different series distant $1\frac{1}{2}$ -3 diameters of aperture 25
 γ. Apertures 6-15 in a series.
- a. Series of apertures distant 3-4 diameters of aperture ... 26
 b. Series of apertures distant 2-3 diameters of aperture.
1. Apertures of the same series distant $\frac{1}{2}$ -2 diameters of aperture 27
 2. Apertures of the same series distant $\frac{1}{2}$ -1 diameter of aperture 28
 2. Reverse face flat or concave, apertures 3-8 in a series ... 29
- B. Zoarium flattened in a plane parallel to the obverse and reverse faces.
- I. Reverse face flat or convex, series of apertures close together, apertures 5-6 in a series ... 30
 II. Reverse face concave, series of apertures far apart, apertures 3-5 in a series 31
- C. Zoarium clavate.
- I. Reverse face convex, apertures 3-7 in a series ... 32
 II. Reverse face concave, apertures 6 in a series ... 33
1. *Reticulipora ramosa*, d'Orbigny, 1851: Bry. Crét., pl. 610, figs. 7-11... *R. clathrata*.
 2. *Reticulipora sarena*, Gabb & Horn, 1860, New Amer. Foss.: Journ. Acad. Nat. Sci. Phil., ser. ix, vol. iv, pl. lxix, figs. 30-32 ... *R. sarena*.
Idmonea dichotoma, Gabb & Horn, 1862, Mon. Foss. Poly. N. Amer.: Journ. Acad. Nat. Sci. Phil., ser. ix, vol. v, pl. xxi, fig. 64 ... *R. dichotoma*.
 3. *Retecava areolata*, Marsson, 1887, Bry. Rüg.: Pal. Abh., vol. iv, pl. iii, fig. 9 ... *R. areolata*.
 4. *Idmonea lineata*, von Hagenow, 1851: Bry. Maastr. kr., pl. ii, fig. 13 ... *R. pseudodisticha*.
 5. *Idmonea gibbosa*, von Hagenow, 1851: loc. cit., pl. ii, fig. 14 ... *R. gibbosa*.
 6. *Crisina unipora*, d'Orbigny, 1851: loc. cit., pl. 613, figs. 1-5 ... *C. unipora*.
Crisina elegans, d'Orbigny, 1851: loc. cit., pl. 613, figs. 6-10...
Idmonea francorum, Pergens, 1890: Revision, pl. xiii fig. 1. "
Retepora gracilis, von Hagenow, 1846: in Geinitz, Grundr. Verst., pl. xxiii b, fig. 4 "
Crisina unipora, Gregory, 1899: Brit. Mus. Cat. Cret. Bry., vol. i, pl. viii, figs. 5 and 6 "
Idmonea unipora, Beissel, 1865, Bry. Aach. kr.: Nat. Verh. Holl. Maatsch. Wet., ser. ii, vol. xxii, pl. viii, figs. 97-99 ... *R. cretacea*.
 7. *Bicrisina Abbotti*, Gabb & Horn, 1862, Foss. Poly. N. Amer.: Journ. Acad. Nat. Sci. Phil., ser. ix, vol. v, pl. xxi, fig. 65 ... *R. Abbotti*.
Idmonea pseudodisticha, Marsson, 1887: loc. cit., pl. ii, fig. 86 ?
 8. *Retepora cancellata*, Goldfuss, 1829: Petref. Germ., vol. i, pl. xxxvi, fig. 17 ... *R. cancellata*.
Retepora cancellata, von Hagenow, 1846: in Geinitz, Grundr. Verst., pl. xxiii b, fig. 2 ... "
Idmonea cancellata, von Hagenow, 1851: Bry. Maastr. kr., pl. ii, fig. 7 ... "
Idmonea cancellata, d'Orbigny, 1853: loc. cit., pl. 748, figs. 20-23 ... "
 9. *Retepora gracilis*, von Hagenow, 1846: in Geinitz, Grundr. Verst., pl. xxiii b, fig. 4 ... *C. unipora*.
 10. *Crisina subgradata*, d'Orbigny, 1851: loc. cit., pl. 612, figs. 6-10... *R. subgradata*.
Idmonea pseudodisticha, Marsson, 1887: loc. cit., pl. ii, fig. 8a ?
Idmonea laticosta, Marsson, 1887: loc. cit., pl. ii, fig. 11 *R. pseudodisticha*.

11. *Idmonea commutata*, Marsson, 1887: loc. cit., pl. ii, fig. 10 *R. pseudodisticha*.
12. *Idmonea cretacea*, Milne Edwards, 1838, Mém. Cris.: Amer. Sci. Nat. Zool., ser. II, vol. ix, pl. xii, fig. 5. Lonsdale, 1850: in Dixon, Geol. Sussex, pl. xviii a, figs. 5, 5a-h *R. cretacea*.
Retecava cretacea, Gregory, 1899: loc. cit., pl. ix, fig. 8. ,,
Idmonea Dixoniana, Mantell, 1844: Med. Creat., vol. I, p. 284, figs. 6, 12 ,,
Crisidmonea macropora, Marsson, 1887: loc. cit., pl. ii, fig. 13 ,,
Retepora lichenoides, Goldfuss, 1827: loc. cit., pl. ix, fig. 13 *R. lichenoides*.
Idmonea lichenoides, von Hagenow, 1851: Bry. Maastr. kr., pl. ii, fig. 6 ,,
Cælophyma granulatum, von Hagenow, 1851: Bry. Maastr. kr., pl. ii, fig. 17 ,,
Idmonea carantina, d'Orbigny, 1853: loc. cit., pl. 748, figs. 1-5 *R. carantina*.
13. *Idmonea disticha*, Michelin, 1845: Icon. Zooph., pl. lii, fig. 18 *C. cenomana*.
Crisina cenomana, d'Orbigny, 1851: loc. cit., pl. 614, figs. 1-5 ,,
Idmonea cenomana, Pergens, 1890: loc. cit., pl. xii, fig. 3. ,,
Retepora disticha, Goldfuss, 1827: loc. cit., pl. ix, figs. 15e, f *R. pseudodisticha*.
Idmonea maculata, von Hagenow, 1851: Bry. Maastr. kr., pl. ii, figs. 3a-d ,,
Heteroerisina Abbotti, Gabb & Horn, 1860: Journ. Acad. Nat. Sci. Phil., ser. II, vol. iv, pl. lxix, figs. 45-47 *R. Abbotti*.
14. *Idmonea striatola*, Marsson, 1887: loc. cit., pl. ii, fig. 9 *R. carinata*.
15. *Idmonea disticha*, Michelin, 1845: loc. cit., pl. lii, fig. 18 *C. cenomana*.
Idmonea insignis, Marsson, 1887: loc. cit., pl. ii, fig. 12 *R. insignis*.
16. *Idmonea cypris*, d'Orbigny, 1853: loc. cit., pl. 749, figs. 7-10 *R. cypris*.
17. *Idmonea francorum*, Pergens, 1890: loc. cit., pl. xiii, fig. 1 *C. unipora*.
18. *Idmonea cretacea*, M. Edwards, 1838: loc. cit., pl. xii, fig. 5 *R. cretacea*.
Idmonea communis, d'Orbigny, 1853: loc. cit., pl. 750, figs. 6-10 ,,
Idmonea prima, Pocta, 1892, Mech. Koryc. Hory.: Cesk. Akad. Cis. Fr. Jos., sect. 2, pl. ii, figs. 7-11 *C. cenomana*.
19. *Crisina normaniana*, d'Orbigny, 1851: loc. cit., pl. 612, figs. 1-5 *C. cenomana*.
20. *Idmonea grandis*, d'Orbigny, 1853: loc. cit., pl. 749, figs. 16-19 *R. grandis*.
21. *Idmonea pseudodisticha*, von Hagenow, 1851: Bry. Maastr. kr., pl. ii, fig. 9. D'Orbigny, 1853: loc. cit., pl. 749, figs. 1-6 *R. pseudodisticha*.
Idmonea irregularis, Beissel, 1865: loc. cit., pl. viii, figs. 102-104 ,,
Idmonea unipora, Beissel, 1865: loc. cit., pl. viii, figs. 98, 100 *R. cretacea*.
Crisina cenomana, var. *triangularis*, d'Orbigny: Gregory, 1899, loc. cit., pl. viii, fig. 7 *C. cenomana*, var. *triangularis*.
22. *Idmonea lichenoides*, von Hagenow, 1851: Bry. Maastr. kr., pl. ii, fig. 6 *R. lichenoides*.
23. *Idmonea geometrica*, von Hagenow, 1851: Bry. Maastr. kr., pl. ii, fig. 11 *R. geometrica*.
24. *Crisina triangularis*, d'Orbigny, 1851: loc. cit., pl. 612, figs. 11-15 *C. cenomana*.
Crisina ligeriensis, d'Orbigny, 1851: loc. cit., pl. 614, figs. 11-15 ,,
25. *Retecava carinata*, Gregory, 1899: loc. cit., p. 198, fig. 17 *R. carinata*.
Idmonea sulcata, von Hagenow, 1851: Bry. Maastr. kr., pl. ii, fig. 12 ,,

- Idmonea cytherea*, d'Orbigny, 1853: loc. cit., pl. 750, figs. 11–15 *R. carinata*.
26. *Crisina ramosa*, d'Orbigny, 1851: loc. cit., pl. 611, figs. 11–15 *R. ramosa*.
- Idmonea macilenta*, von Hagenow, 1851: Bry. Maastr. kr., pl. ii, fig. 4 "
- Idmonea divaricata*, Ubaghs, 1865, Bry. Schicht. Maastr.: Verh. naturh. Ver. Preuss. Rheinl., vol. xxii, pl. iii, fig. 8 "
27. *Retepora clathrata*, Goldfuss, 1827: loc. cit., pl. x, figs. 12a, d *R. clathrata*.
- Idmonea clathrata*, von Hagenow, 1851: Bry. Maastr. kr., pl. ii, fig. 2 "
- Retecara clathrata*, d'Orbigny, 1853: pl. 790, figs. 5–9. "
- Idmonea verriculata*, von Hagenow, 1851: Bry. Maastr. kr., pl. ii, fig. 5 "
28. *Idmonea carinata*, Roemer, 1840: loc. cit., pl. v, fig. 20. *R. carinata*.
29. *Idmonea filiformis*, d'Orbigny, 1853: loc. cit., pl. 750, figs. 1–5 *R. pseudodisticha*.
- Idmonea angulosa*, d'Orbigny, 1853: loc. cit., pl. 748, figs. 11–15 *C. angulosa*.
- Idmonea marginata*, d'Orbigny, 1853: loc. cit., pl. 749, figs. 20–23 *C. marginata*.
- Idmonea lata*, d'Orbigny, 1853: loc. cit., pl. 748, figs. 6–10. "
- Idmonea excavata*, d'Orbigny, 1853: loc. cit., pl. 749, figs. 11–15 "
- Idmonea calypso*, d'Orbigny, 1853: loc. cit., pl. 747, figs. 11–14 *C. cenomana*.
30. *Idmonea plana*, Poeta, 1892: loc. cit., pl. ii, figs. 1, 2 *C. plana*.
31. *Clavitubigera navicularis*, Beissel, 1865: loc. cit., pl. viii, figs. 94–96 *C. navicularis*.
32. *Clavitubigera convexa*, d'Orbigny, 1853: loc. cit., pl. 746, figs. 12–15 *C. convexa*.
- Clavitubigera angustata*, d'Orbigny, 1853: loc. cit., pl. 746, figs. 16–20 "
33. *Clavitubigera excavata*, d'Orbigny, 1853: loc. cit., pl. 747, figs. 6–9 *C. Fischeri*.
- Idmonea Fischeri*, Pergens, 1890: loc. cit., pl. xii, fig. 4. "

VII.—THE COMPARATIVE FERTILITY OF THE SOIL ABOVE CERTAIN GEOLOGICAL FORMATIONS.

By JAMES LOVE, F.G.S., F.R.A.S.

WHILE travelling over the country it may be noticed that the land is not uniformly fertile. In some places there is greater luxuriance and greater variety of plant life than in others. The question which such observations call forth is what is the cause of these differences? An attempt has been made to give some sort of answer to this question in the following manner:—A limited area has been selected which is traversed by a number of geological formations, and the plants growing on that area have been catalogued. The area selected in the present instance is the county of Surrey, that being the county which is best known to me. Surrey is too small a county to have any difference of climate. The differences of altitude would probably bring about some variety in the flora, but the differences of latitude could scarcely have any appreciable effect. The county is, however, large enough to include a dozen different rock