DIAGNOSIS.—Body hemispherical; base flattened, slightly convex in middle as if for attachment. Whole surface, including base, covered with a reticulating network of polygonal cells of irregular shape and unequal size; many are hexagonal or pentagonal, and in one specimen (*b* 53) they are subequal in size. General superficial appearance resembles *Favosites*. No internal structure known.

MEASUREMENTS.—Diameter of most perfect specimen, 30 mm.; height, 17 mm.

EXPLANATION OF PLATE XVIII.

- FIG. 1.—*Monticulipora poculum*, Salter. Wenlock Limestone: Dudley. Fletcher Collection. $\times 1\frac{1}{2}$.
 ,, 2.—A part of the same, showing longitudinal section near margin. $\times 10$.
 ,, 3.—A part of the same, showing spiniform and polygonal corallites. $\times 10$.
 ,, 4.—*Trachypora* (?) *Seeleyi*, Salter. Wenlock Limestone: Dudley. Fletcher Coll. $\times 2$.
 ,, 5.—A part of the same. $\times 5$.
 ,, 6.—*Pasceolus* (?) *hospitalis* (Salter). Middle Bala: Onny River. $\times 1\frac{1}{2}$.
 ,, 7.—A part of the same. $\times 4$.
 ,, 8.—*Graptotheca catenulata*, Salter. Lower Ludlow: Leintwardine. Nat. size.

II.—NOTE ON *NAUTILUS ROBUSTUS*, FOORD & CRICK.

By G. C. CRICK, F.G.S., of the British Museum (Natural History).

THE species *Nautilus robustus* was founded¹ by Dr. Foord and myself upon three examples in the British Museum collection, bearing respectively the register numbers 37,010, 37,005, and C. 1,944.

The specimen numbered 37,010 was regarded as the type (see accompanying Figures). It originally formed part of the Tesson Collection, and is stated to be from the "Inferior Oolite, Les Moutiers, Normandy." The horizon, however, given by us in our original description, and subsequently also by Dr. Foord in his "Catalogue of the Cephalopoda in the British Museum (Natural History)," vol. ii, pp. 205-7, is "Upper Lias."

The example bearing the number 37,005 belonged also to the Tesson Collection, and was labelled "*Nautilus inornatus*, d'Orb. Lias supérieur, Cury." The third specimen, which is numbered C. 1,944, lacks any information as to the horizon and locality whence it was obtained, but it is probably a British fossil.

Quite recently Mr. S. S. Buckman informed me that there were two examples of this species in the Cheltenham College Museum, and through the kindness of the authorities of the College, to whom I desire to express my sincere thanks, the specimens have been sent to me for examination, so that I have been able to compare them with the type-specimen. The larger specimen is labelled in Mr. S. S. Buckman's handwriting, "Marlstone. Loc: unknown; but probably near Cheltenham, and possibly Alderton Hill."² The

¹ A. H. Foord & G. C. Crick: *Ann. & Mag. Nat. Hist.*, ser. vi, vol. v (1890), p. 271, fig. 5.

² Mr. Buckman tells me that this is "perhaps the *Nautilus obesus* mentioned in 'Geology of Cheltenham,' ed. 2, p. 40."

other specimen bears an original label with the inscription "*Nautilus*, Marlstone. Gretton."¹ Fully agreeing with Mr. Buckman's identification of these specimens, I was led to enquire into the geological age of the examples in the National Collection, for if the Cheltenham College specimens are correctly identified, it would seem that the species belongs to the Marlstone or Middle Lias, rather than to either the Upper Lias or to the Inferior Oolite.

Nautilus robustus.—*a*, lateral view, showing the cast of part of the body-chamber, the test being present in the septate part of the shell, where a few lines of growth are indicated; *b*, front view. Middle Lias: Les Moutiers, Normandy, France. Drawn from the type-specimen in the British Museum collection [No. 37,010]. Rather less than one-third natural size.

As already stated, one of the examples on which the species was founded, viz., the specimen in the British Museum bearing the register number C. 1,944, lacks any information respecting the horizon and locality whence it was obtained. Its matrix, however, agrees with that of the specimen in the Cheltenham College Museum that is labelled "*Marlstone*. Loc: unknown; but probably near Cheltenham, and possibly Alderton Hill." It is therefore more than probable that this fossil is a British specimen, and that it came from the Marlstone.

As mentioned above, the specimen regarded as the type, and figured, originally formed part of the Tesson Collection. It has the following measurements: diameter (without test near aperture), 204 mm.; thickness (without test on each side), 136 mm.; width of umbilicus (test present on each side), 33 mm. One-third of the last whorl is occupied by the body-chamber. The specimen does

¹ In regard to this specimen Mr. Buckman writes me as follows: "The label is one of my father's; the writing on it is very similar to his. Many specimens in the Museum were presented by my father, and it is therefore quite likely that he collected this specimen himself."

not bear an original label, but is numbered 37,010, and has been registered as "*Nautilus* sp., Inferior Oolite, Les Moutiers, Normandy." As stated in the remarks appended to the original description of the species by Dr. Foord and myself, a figure of the type-specimen was submitted to Dr. Paul Fischer, of the Museum of Natural History, Paris, who kindly replied to the effect that he found no form either in the Museum of Natural History, the Museum of the École des Mines, nor in that of the Sorbonne, which could be identified with certainty with our specimen. He observed that it resembles perhaps some specimens of *Nautilus Toarcensis*, d'Orb., but that the umbilicus in the latter appears more open and the aperture more dilated, remarks with which we fully concurred. The affinities of the species being nearest to *Nautilus Toarcensis*, d'Orb., from the Upper Lias, and the specimen numbered 37,005, being apparently specifically identical and bearing an original label indicating that it came from the Upper Lias, it seemed most probable that the new species belonged to the Upper Lias. But there are portions of other fossils preserved in the matrix, among them being a portion of a Belemnite, and a fairly good impression of an Ammonite (see Figures). A plaster squeeze of this Ammonite was taken, and submitted—the specimen being registered as from the "Inferior Oolite"—to Mr. S. S. Buckman for his opinion, and he very kindly replied as follows:—"It is certainly a *Paltoleuroceras*, and is nearest to *Am: costatus nudus*, Quenst. Jura, Pl. 21, f. 3, which Hyatt made type of his *Pleuroceras pseudocostatum*, Bull. Mus. Comp. Zool. Foss. Ceph. No. 5, p. 90, 1867. It is also near to the specimen figured by Quenst[edt] Schwäb. Amm. Pl. 42, fig. 19 only as *A. costatus nudus*; but this is a different form from that of the Jura. . . .

"Your specimen is exactly identifiable with specimens which are not uncommon in the marlstone of Dumbleton (Alderton Hill) near here [Cheltenham], and at South Petherton—specimens which for want of a better name I have called *Paltoleuroceras nudum*; these specimens are characteristic of Middle Lias (Marlstone), and of the Spinati η . That is therefore the date of your *N. robustus*. . . .

"Quenstedt called his species *nudus* as being without *spines*. Yours has, I think, some indication of spines. I have a specimen very like yours from Mid: Lias, Tilly sur Seuilles, Calvados, and it is well-spined. Both spined and unspined forms occur at Dumbleton, etc., so this point makes no difference as regards horizon."

The present writer fully concurs with Mr. Buckman's determination of the fossil, and therefore regards the type-specimen of *Nautilus robustus* as of Middle Liassic age.

When the original description of the species was framed it was not possible to give the position of the siphuncle. Fortunately the smaller of the Cheltenham College specimens (the example from Gretton) enables us to supply this deficiency. A portion of the last whorl can be detached and the siphuncle seen very clearly. Where the height of the whorl is 49 mm., its width 56 mm., and the

distance of the periphery from the preceding whorl 42 mm., the centre of the siphuncle is 13.5 mm. from the preceding whorl, and therefore 28.5 mm. from the periphery. The position of the siphuncle may therefore be described as infra-median, or, in the terminology suggested by Professor Hyatt,¹ 'intracentrodorsan.'

The other French specimen originally referred to this species, viz., the example in the British Museum bearing the register number 37,005, also belonged to the Tesson Collection, and bears an original label with the following inscription: "[*Naut*]ilus inornatus, d'Orbigny. [Lias] sup[ér]ieur. Curcy." It has the following measurements: diameter (without test near aperture), 166 mm.; thickness (without test on one side), 116 mm.; width of umbilicus (with test), 25 mm. These dimensions agree very closely with those of the type-specimen, the latter having the following dimensions at a diameter of 160 mm.: diameter (with test), 160 mm.; thickness, estimated at about 117 mm.;² width of umbilicus (with test), 26 mm. Only a small portion of the body-chamber is preserved. So far, then, as external characters are concerned, it does not seem possible to separate this example from the type-specimen of *N. robustus*. It is true that the example from Curcy is labelled "Lias supérieur," but since the Middle Lias, including beds corresponding to our Marlstone, also occurs at the same locality,³ it is quite possible that the specimen may have come from these beds.

Of the examples belonging to the Cheltenham College Museum that we refer to this species, the larger one is stated to be from the "Marlstone. Loc: unknown; but probably near Cheltenham, and possibly Alderton Hill." The measurements are: diameter of shell (without test), 220 mm.; thickness (without test), 153 mm.; and width of umbilicus⁴ (without test), about 33 mm.; from which it will be seen that this example is not only somewhat larger than the type-specimen, but it is also relatively somewhat thicker, whilst the umbilicus is relatively somewhat narrower. The smaller specimen is labelled "Marlstone, Gretton," [near Dumbleton]. It has the following dimensions: diameter (without test), 165 mm.; thickness (without test), 119 mm.; and width of umbilicus (with test on one side), 26 mm. Only a small portion of the body-chamber is preserved. These dimensions agree fairly well with those of the type-specimen at a diameter of 160 mm. Also the general characters of these fossils agree so well with those of the type, that it will probably be correct to regard the slight differences in their dimensions as merely individual variations.

It may be useful to give in tabular form the measurements of the

¹ A. Hyatt, "Phylogeny of an acquired characteristic": Proc. Amer. Philos. Soc., vol. xxxii, no. 143 (August, 1894), p. 430.

² One side of the fossil is broken away, so that the thickness can only be estimated.

³ "Le type normal du Toarcien de Normandie se trouve aux environs d'Évrecy, de la Caine et de Curcy, où la zone à *Am. spinatus* supporte une argile dite à *Leptæna*, c'est-à-dire à petits brachiopodes d'aspect paléozoïque, *Koninckella*, *Cadomella*, etc." (Lapparent, Traité de Géologie, 4^{me} ed., 1900, tom. 2, p. 1089.)

⁴ The umbilicus is filled with matrix.

examples which are referred to this species. I is the type-specimen from [the Middle Lias] Les Moutiers, Normandy [B.M. no. 37,010]; II, the specimen from the [Middle] Lias, Cury [B.M. no. 37,005]; III, the example from the Marlstone, Alderton Hill? [Cheltenham College Museum, no. 900]; IV, the specimen from the Marlstone, Gretton [Cheltenham College Museum, no. 901]. (For comparison with the other examples the measurements of the French specimens are given both at their greatest diameter and also at a diameter of 160 mm. and of 128 mm. respectively.)

	I.		II.		III.	IV.
	Ratio to mm. diam.	Ratio to mm. diam.	Ratio to mm. diam.	Ratio to mm. diam.	Ratio to mm. diam.	Ratio to mm. diam.
Diameter ...	204+(100)	160 (100)	166+(100)	128 (100)	220+(100)	165+(100)
Thickness ...	136+(66·6)	117+(73·1)	116+(69·8)	87+(68)	153+(69·5)	119+(72·1)
Width of umbilicus }	33 (16·1)	26 (16·2)	25 (15)	20 (15·6)	33—(15)	26—(15·7)

I think it highly probable that to this species belongs also a specimen in the National Collection [No. C. 4,487] from the Middle Lias of South Petherton, Somerset. It is entirely septate, and has the following dimensions: diameter of shell (wanting test near aperture), 130 mm.; thickness of outer whorl (wanting test on one side), 78 mm.; width of umbilicus (test present on each side), 21 mm.

III.—ON THE DISTRIBUTION OF THE *GLOSSOPTERIS* FLORA.

By E. A. NEWELL ARBER, M.A., F.G.S., Trinity College, Cambridge; University Demonstrator in Palaeobotany.

AMONG extra-European fossil floras, none is perhaps better known than that of the Permo-Carboniferous rocks of the Southern Hemisphere. These rocks are extensively developed in Southern India, Australia, South Africa, and South America,¹ and there can be little doubt that these regions once formed part of a great continent, to which the name Gondwana-land has been appropriately applied.

The flora of Gondwana-land differs in a remarkable degree from the contemporaneous flora of Europe and North America. The characteristic and predominant plant types in Europe in the Permo-Carboniferous period were *Calamites* among Equisetales, *Lepidodendron* and *Sigillaria* among Lycopodiales, with numerous representatives of the Filicales, and of three groups, now long extinct, the synthetic types Cycadofilices and Cordaitales,² and the isolated phylum Sphenophyllales. These compose what we may term the northern type of Permo-Carboniferous flora.

The *Glossopteris*, or southern Permo-Carboniferous flora, consists essentially of four types, *Phyllothea* and *Schizoneura* among Equisetales, the fern-like plant *Glossopteris*, including *Gangamopteris*,³

¹ Seward: Science Progress, 1897, vol. vii, p. 198.

² Scott: Trans. R. Soc. Edinb., 1902, vol. xi, pt. 2, p. 331.

³ Etheridge: Proc. Linn. Soc. N.S. Wales, 1894, ser. II, vol. ix, p. 228.