the other shield-bearing Phyllopora; if a larval form, it may have been the early stage of *Prestwichia* or some other of the Coal-measures *Limulidæ*. Nor do we think it in the least probable that the shield of *Cyclus radialis* was flexible or contractile, its original segments being completely soldered together into one piece."

Even amongst the Decapod Crustaceans we may, in the larval and embryonal stages, find analogous forms to our fossil *Cyclus*. Thus Mr. J. O. Westwood in the Phil. Trans., Vol. I., Part II., 1835, figures from Guilding's MSS., the larva of a recent Land-crab having the appearance presented in the subjoined Woodcut.

The recent investigations of Dr. A. S. Packard, jun., and the Rev. S. Lockwood, tend further to confirm the opinion expressed by me in 1868, that these forms may indeed be the larval stages of *Prest-*

Figures of Larva of a Recent Land-Crab.
1. Nat. size. 2. Dorsal, 3. Ventral aspect.

wichia, *Belinurus*, etc., the ante-types in Carboniferous times of the modern King-crab.

EXPLANATION OF PLATE XXIII.

- FIG. 1. *Cyclus Rankini*, H. Woodward, from the Carboniferous Shale of Carlisle, Lanarkshire, from the cabinet of Dr. Rankine, Carlisle. Enlarged 3 times. Dorsal aspect of carapace.
- FIG. 2. *Cyclus radialis*, Phil., sp., from the Carboniferous Limestone, Visé, Belgium. This species also occurs at Bolland and Settle, in Yorkshire; Little Island, Cork, etc. (Original specimen in the British Museum collection.)
- FIG. 2a. Side view of same. Both figures enlarged twice natural size.
- FIG. 3. and 3a. *Cyclus bilobatus*, H. Woodward, dorsal aspect and profile, from the Carboniferous Limestone of Settle, Yorkshire. Enlarged 4 times. (From the Cabinet of Mr. J. H. Burrow, Settle.)
- FIG. 4. and 4a. *Cyclus torosus*, H. Woodward, dorsal aspect and profile, Carboniferous Limestone, Little Island, Cork, Ireland. Enlarged 4 times. (From the Collection of Mr. Joseph Wright, Belfast.)
- FIG. 5. and 5a. *Cyclus Wrightii*, H. Woodward, dorsal aspect and profile, Carboniferous Limestone, Little Island, Cork. Enlarged 4 times. (Collection of Mr. Joseph Wright, Belfast.)
- FIG. 6. and 6a. *Cyclus Harknessi*, H. Woodward, dorsal aspect and profile, from the Carboniferous Limestone of Little Island, Cork, etc. Enlarged 4 times. (Collection of Mr. Joseph Wright, Belfast.)
- FIG. 7. and 7a. *Cyclus (Halicyne) laxus*, H. von Meyer, sp. Muschelkalk, Rottweil, Germany.
- FIG. 8. and 8a. *Cyclus (Halicyne) agnotus*, H. von Meyer, sp. Muschelkalk, Rottweil, Germany.
- FIG. 9. "*Cyclus Brongniartianus*," De Koninck. Hypostome of a Trilobite, probably of the genus *Phillipsia*, from the Carboniferous Limestone, Bolland, and Settle, Yorkshire; Blackrock, near Cork, and Visé, Belgium. (From the Collection of Mr. Joseph Wright, of Belfast.) Enlarged twice natural size.

V.—ON SECONDARY SPECIES OF BRACHIOPODA.¹

By J. F. WALKER, M.A., F.G.S., etc.

I HAVE already described in this Magazine several new species of Brachiopoda from the Lower Greensand of Upware¹; since then I have obtained many more specimens, and much kind assistance from

¹ See GEOL. MAG. 1868, vol. V., p. 399, Pl. XVIII. and XIX.

Mr. Davidson, and I now propose to give the result of the examination of the new forms in this paper; also to more fully describe a *Rhynchonella* from the Inferior Oolite of Lincolnshire, which I have named *Rhynchonella Crossii*.

Among the Upware specimens, the following new species and varieties have been met with:—

Terebratula Seeleyi, n. sp. Figs. 6, 7, and 8.—Shell elongated, ovate, moderately convex, shell surface smooth, marked by faint concentric lines of growth; ventral valve convex, curving regularly to the beak, which is very slightly recurved, and is truncated by a large round foramen; beak ridges slightly rounded, space between them and the deltidium flat; deltidium in one piece, large and moderately wide; dorsal valve elongated, moderately convex, the front margin not plicated, rounded; the shell becomes thin towards the front and lateral margins; greatest width about the middle of the shell. Loop short. Dimensions of the specimens figured: length 1·5 in., breadth 0·9 in., thickness 0·7 in.; and length 0·9 in., breadth 0·6 in., thickness 0·35 in. I have much pleasure in naming this fossil in compliment to H. G. Seeley, Esq., F.G.S. This species is well marked by its elongated form and absence of plications.

Terebratula depressa.—The specimens referred to this species vary so much from each other that it is necessary to distinguish the following sub-species, in addition to the sub-species *T. cyrta*, nobis.

Var. *T. uniplicata*, Figs. 1 and 2.—Shell somewhat triangular in form, with one wide mesial fold; shell surface smooth, marked by faint concentric lines of growth, greatest width about the middle of the shell; from thence it tapers to the beak, which is nearly straight, and is truncated by a large circular foramen; beak ridges rounded; deltidium wide, in one piece. At the front margin there is a wide central fold, formed by a depression of the ventral and a corresponding elevation of the dorsal valve. Loop short. Dimensions of the figured specimen; length 2·4 in., breadth 2·1 in., thickness 1·2 in.

Var. *Terebratula Cantabridgiensis*, Figs. 3, 4, and 5.—Shell moderately convex, surface smooth, marked by concentric lines of growth; beak slightly recurved, deltidium wide, in one piece; front margin of the ventral valve slightly elevated at the centre, then depressed, and again elevated; dorsal valve has two ridges which rise from near the centre of the valve, and terminate at the front margin, having between them a wide central depression. Loop short. Dimensions of the specimen figured: length 1·7 in., breadth 1·25 in., thickness 1·05 in. This form varies considerably with regard to the thickening of the front margin; some specimens have the front margin thinner and more rounded than the specimen figured, but retain the same form of plication, being reverse to the var. *T. uniplicata*, which has the central elevation on the dorsal valve and the depression on the ventral valve. *T. Cantabridgiensis* differs from *T. Dutempleana* in having the beak less recurved and the front margin more rounded. This variety approaches *T. praelonga* in the plications, but differs from that species in its greater width, form of its beak, etc.

Terebratula Davidsoni.—I have obtained a very small specimen of

this species, which measures, length 0·23 in., breadth 0·2 in., thickness 0·13 in.

Waldheimia mutabilis, var. *W. elliptica*.—The largest specimen I have of this species measures, length 1·7 in., breadth 1·3 in., thickness 0·65 in.

Waldheimia pseudojurensis.—This species has its deltidium in two pieces. Loop long. In Vol. V., Pl. XVIII., the deltidium was figured in one piece by mistake.

Waldheimia rhomboidea.—Mr. Davidson kindly informs me that this name has been given to an Italian Tertiary shell by Biondi in 1855, and its name requires to be changed. I have therefore much pleasure in naming it *W. Juddii*, in honour of J. W. Judd, Esq., F.G.S.

Terebratula sella, figured in GEOLOGICAL MAGAZINE, September, 1868. —This specimen differs from the typical form, and somewhat approaches specimens of *T. Carteroniana* (D'Orb.). Mr. Davidson thinks that it ought to be distinguished as a variety—*T. sella*, var. *T. Upwarensis*. Shell globular, deeply plicated, sides of the shell compressed, surface smooth, marked by faint concentric lines of growth; ventral valve very much recurved, the deep plications extending about two-thirds of the length of the valve, forming a central elevation on each side of it, and a deep depression, again rising into an elevation, thence bending at right angles, it forms the flat side of the shell; the upper third of the shell is somewhat convex, the beak curved, short, truncated by a large round foramen, the margin of which is thickened at the sides; beak ridges rounded, deltidium in one piece, shallow and wide; dorsal valve irregularly round in shape, upper two-thirds nearly flat, lower (front part) deeply plicated, having a deep groove in the centre, bounded on each side by an elevation, then a wide depression which slopes to meet the lateral elevations of the ventral valve, thence rising to the level of the flat part of the valve, where the shell has its greatest width. Loop short. Average dimensions: length 1·1 in., breadth, 0·9 in., thickness, 0·8 in.

Besides the specimens described in this and my previous papers, there are found at Upware and at Potton, derived specimens of a large *Terebratula*, which has been referred by Mr. E. R. Lankester to *T. rex*. These specimens vary very much in form and dimensions. There are also found, both at Upware and Potton, derived specimens of two or three species of *Rhynchonella*, the species of which I have not yet been able to determine.

I have found at Farrington, Berkshire, in the sponge gravel, a specimen of *T. praelonga*, which species also occurs at Upware, and in the Lower Greensand of the South of England.

Rhynchonella Crossii, Fig. 9.—Shell wider than long, smaller valve convex with about fourteen plaits on its surface; the plaits are covered by spines, the three central plaits are elevated; the larger valve is depressed in the centre, having a wide fold formed of four plaits; the number of plaits on this valve is about fourteen, which are also covered by spines; the beak is recurved. Length 0·3 in., breadth 0·4 in., thickness 0·25 in.

New Forms of Brachiopoda from the Lower Greensand of Upware.

This species differs from *T. spinosa* in having the deep strongly marked fold formed by a depression of the larger, and the elevation of the smaller valve. The number of the plaits is fewer, and it does not appear to attain a larger size than the specimen figured. This species is common in the Inferior Oolite of Appleby, Brigg, Lincolnshire, but it is difficult to obtain perfect specimens. I have dedicated this species to the Rev. J. E. Cross, M.A., F.G.S., who gave me the specimen figured.

I have presented the specimens figured to illustrate this paper to the British Museum.

EXPLANATION OF FIGURES OF LOWER GREENSAND BRACHIOPODA FROM UPWARE.

Figs. 1 and 2.—Front and side view of *Terebratula depressa*, var. *uniplicata*.

Figs. 3 and 4.—Front and side view of ———— var. *Cantabrigiensis*.

5.—Pallial border of same, showing the central elevation on the ventral valve.

Figs. 6 and 7.—Front and side view of *Terebratula Seeleyi*, sp. nov.

8.—Small example of same.

9.—Three views of *Rhynchonella Crossii*, sp. nov.

All the specimens are figured of the natural size.

VI.—ON THE DISPERSION OF CRIFFELL GRANITE AND CALDBECK PORPHYRY OVER THE PLAIN OF CUMBERLAND.¹

By D. MACKINTOSH, F.G.S.

THE following is a very brief statement of the results of nearly two months' observations on the granitic and porphyritic drift of the north and north-west of Cumberland.

Derivation and Mode of Dispersion of the Granitic Drift.—From a little to the east of Workington, the south-eastern boundary of this drift crosses the river Derwent, and runs along between Great Broughton and Wyndham Row, north of Tallantire, by Parsonby, and Torpenhow, in the direction of Ireby; it then winds round the west and north slopes of Brocklebank ridge in a line running south of the Red Dial and Nether Welton. I have found the granite as far east as Wetherall, and believe it extends much farther, while on the north it approaches, if it does not cross, the Scottish Border. The boulders, most of which have been dug out of the fields,² occur principally in a sea-coast area reaching as far south as Workington, as far north as Allonby, and nearly as far east as Mealsgate; though, in thinly-scattered groups, and isolated blocks of smaller size, they may be seen farther to the north and east.³ They rapidly increase in size and numbers towards the sea-coast, or in the direction of Criffell (on the opposite side of the Solway Firth), and gradually thin out inland until they can no longer be detected. There are comparatively few in the valley of the Ellen, even where other erratics are present. On the ridge to the north-west of this valley, and the part of the

¹ For Kirstone and Kirston, read Kirkstone, in my last article (GEOL. MAG. for Oct.).

² The so-called surface-blocks are those which have escaped being buried, or which have been disinterred by farmers. The boulders of granite and other rocks are found principally in the lower Boulder-clay, but they are not absent from the upper.

³ Nearly all the boulders are more or less rounded.