leaf-impressions of *Glossopteris*, although the specimens are fragmentary and badly preserved. Fronds of *Glossopteris indica*, Schimp., appear to be frequent in this locality.

Other specimens from Rumpi Gorge, Mount Waller area, near Lake Nyasa, which are all very poorly preserved, show fragments of *Glossopteris*-fronds and leaves somewhat resembling those known as *Næggerathiopsis*, but are too imperfect to be determined.

The collection, as a whole, is interesting, as confirming the occurrence of the species of *Glossopteris* previously recorded from Portuguese East Africa by Potonié, and as adding to our knowledge of the *Glossopteris* Flora as there developed. The addition of *Glossopteris retifera*, Feist., to the list is of interest, for this species has already been recorded from South Africa as well as from India. The specimens of *Schizoneura* appear to be much more perfect than those named by Potonié, and are almost certainly identical with *Sch. gondwanensis*, Feist., and not *Sch. meriani*, with which species Potonié compared his fragmentary examples. Among other new additions are possibly *Glossopteris ampla*, Dana, and specimens which may be compared with *Vertebraria* and *Næggerathiopsis*.

APPENDIX II.—NOTES ON SOME FOSSIL NON-MARINE MOLLUSCA AND A BIVALVED CRUSTACEAN (*ESTHERIELLA*) FROM NYASALAND.¹ By RICHARD BULLEN NEWTON, F.G.S.

[PLATES XVIII & XIX *pars.*]

THE specimens described in these notes have been collected by Messrs. A. R. Andrew & T. E. G. Bailey in the north-western area of Nyasaland, during a mineral survey carried out between the years 1906 and 1908, under the auspices of the Imperial Institute, the authorities of which have kindly presented them to the Geological Department of the British Museum (Natural History). They consist of Quaternary gastropoda and Palæozoic pelecypoda, accompanied by *Estheriella*, all of which exhibit non-marine characters.

Quaternary Gastropoda.²

The Quaternary gastropoda include both freshwater and terrestrial forms belonging to the recent fauna of Lake Nyasa and its surrounding shores. Generally speaking, these specimens are of fresh appearance and well preserved, frequently showing remnants of coloration and periostracum—a condition which more particularly applies to the land-shells. The freshwater shells comprise the genera *Viviparus* and *Lanistes*, the former having been obtained from deposits at Chiwondo on Lake Nyasa, at an elevation of 20 feet

¹ Communicated by permission of the Trustees of the British Museum.

² The deposits in which these shells occur are described on p. 223.

above the water-level, as well as 3 miles west of that village at the altitude of 350 feet above the same level, where they occur as marl-casts, and again at Chisali, 15 miles west of the lake, at an elevation of 400 feet, where their casts form a limestone of some durability. Examples of *Lanistes* were collected at Chiwondo from a height of 20 feet, in association with well-preserved *Viviparus*.

The terrestrial shells are localized from Chiwondo and Masiunjuti, the latter place being situated some 12 miles west of the lake-margin, where the specimens were found on the top of the sands and marls.

The Chisali specimens appear, however, to be of greatest interest, since they indicate a considerable north-westerly extension of Lake Nyasa in Quaternary times. They occur as casts in a cream-coloured limestone, where all evidence of shell-structure has been dissolved away, although, from wax impressions of the more perfect natural moulds, it has been possible to determine, with a fair amount of certainty, their relationship to *Viviparus unicolor*, a present-day inhabitant of Lake Nyasa and other freshwater regions of Africa.

Freshwater Forms.

Genus *VIVIPARUS*, Montfort.

'Conchyliologie Systématique' 1810, vol. ii, p. 246.

Type=*Helix vivipara*, Linn.

Synonym: *Vivipara*, Lamarck, 1809 [=list-name only].

VIVIPARUS UNICOLOR (Olivier). (Pl. XVIII, figs. 1-5.)

Cyclostoma unicolor, Olivier, 'Voy. Emp. Oth. Égypte, Perse' 1804 (=An xii), vol. iii, p. 68 & atlas, pl. xxxi, fig. 9.

Vivipara capillata, *robertsoni*, *jeffreysi*, von Frauenfeld, Verhandl. Zool.-Bot. Gesellsch. Wien, 1866, vol. xv, pp. 532-33 & pl. xxii.

Vivipara unicolor, Jickeli, Nova Acta K. Leop.-Carol. Deutsch. Akad. Naturf. vol. xxxvii (1874) p. 235.

Paludina unicolor, Blanckenhorn, Zeitschr. Deutsch. Geol. Gesellsch. vol. liii (1901) p. 432.

The few isolated examples of this species in the collection are somewhat worn, otherwise they exhibit the basal angulation and some obscure spiral sculpture. They compare favourably with Olivier's original figures and with Jickeli's later descriptions in possessing about six whorls, the earlier being more or less con-
tabulate, while the basal bears an obscure angulation.

So far as dimensions are concerned, they also correspond with those given by Jickeli, the largest specimen having a height of nearly 25, a maximum diameter of 18, and an aperture measuring 12 by 10 millimetres.

In making this determination, the broadest view of Olivier's *unicolor* has been adopted, since the species has hitherto been regarded as belonging chiefly to Nile waters and not forming part of the Nyasa fauna. A careful comparison of forms in the Zoological Department of the British Museum has, however, induced me

to include in it Frauenfeld's *capillata*, *robertsoni*, and *jeffreysi*, all of which are found in the lake at the present day. Mr. Edgar Smith, who has for long studied the mollusca of African fresh waters, agrees with me in thinking that if examples of *capillata*, at least, were mixed with a series of *unicolor*, it would be almost impossible to separate them. In this connexion, it is interesting to note that Dr. E. von Martens regards *jeffreysi* as a variety of *unicolor*, and *robertsoni* as closely allied.

Localities.—The isolated shells were obtained at an elevation of 20 feet above the present lake-level at Chiwondo; the marl-casts came from about 3 miles west of Chiwondo, at an elevation of some 350 feet; while the limestone-casts were collected at Chisali, some 15 miles west of the lake-margin, at a height of about 400 feet.

Distribution.—The species was originally described from the canal at Alexandria, and has since been recorded from most African freshwaters. Jickeli mentioned its occurrence in a subfossil state in the neighbourhood of the Libyan Desert, and in later years Dr. Blanckenhorn recognized it in the Quaternary deposits of the Nile Valley near Wadi Halfa.

Genus LANISTES, Montfort.

'Conchyliologie Systématique' 1810, vol. ii, p. 123.

Type = *Cyclostoma carinata*, Olivier.

LANISTES SOLIDUS, E. A. Smith. (Pl. XVIII, figs. 6 & 7.)

Lanistes solidus, E. A. Smith, Proc. Zool. Soc. London (1877) 1878, p. 716 & pl. lxxiv, fig. 10.

This species is represented by large (66×62 millimetres) and medium-sized (40×38 mm.) specimens in a good state of preservation, with remnants of the periostracum sometimes preserved.

Locality.—Chiwondo: at an elevation of about 20 feet above present lake-level.

Distribution.—Lake Nyasa.

Terrestrial Forms.

Genus ACHATINA, Lamarck.

Mém. Soc. Hist. Nat. Paris, 1799, p. 75.

Type = *Bulla achatina*, Linn.

ACHATINA CRAVENI, E. A. Smith.

Achatina kirkii, E. A. Smith, Ann. & Mag. Nat. Hist. ser. 5, vol. vi (1880) p. 428.

Achatina craveni, E. A. Smith, Proc. Zool. Soc. London, 1881, p. 233 & pl. xxxiii, fig. 11; *ibid.* 1899, p. 590 & pl. xxxv, figs. 1-2.

Localities.—Chiwondo; Masiunjuti.

Distribution.—In regions between Lake Nyasa and the East Coast of Africa.

Genus *BULIMINA*, Ehrenberg.

Hemprich & Ehrenberg, 'Symbolæ Physicæ: Animalia Evvertebrata
exclusis Insectis' 1831 (pages not numbered).

Type = *Bulimus labrosus*, Olivier.

BULIMINA BOIVINI (Morelet).

Glandina boivini, Morelet, 'Séries Conch.' 1860, pt. 2, p. 72 & pl. v, fig. 5.
Buliminus boivini, E. A. Smith, Proc. Zool. Soc. London, 1899, p. 587.

Locality.—Masiunjuti.

Distribution.—Nyasa Plateau (Zomba).

Genus *MARTENSIA*, Semper.

'Reisen Archip. Philipp. Landmollusken' 1870, vol. iii, p. 42 & pl. iii, fig. 5.

Type = *Helix mozambicensis*, Pfeiffer.

MARTENSIA MOZAMBICENSIS (Pfeiffer).

Helix mozambicensis, Pfeiffer, Proc. Zool. Soc. London, 1855, p. 91 & pl. xxxi,
fig. 9.

Martensia (Trochonanina) mossambicensis, E. von Martens, in Bornhardt's
'Deutsch-Ost-Afrika' [Möbius] vol. iv (1898) p. 46.

Localities.—Chiwondo; Masiunjuti.

Distribution.—Nyasa Plateau (Zomba).

Genus *TROPIDOPHORA*, Troschel.

Zeitschr. Malakozoologie [Menke & Pfeiffer], 1847, p. 44.

Type = *Cyclostoma cuvierianum*, Petit.

TROPIDOPHORA NYASANA, E. A. Smith. (Pl. XVIII, figs. 8 & 9.)

Pomatias nyasanus, E. A. Smith, Proc. Zool. Soc. London, 1899, p. 591 &
pl. xxxv, fig. 5.

Tropidophora nyasana, E. A. Smith, MS. (as determined in the Zool. Dept.
Brit. Mus. Nat. Hist.).

Localities.—Chiwondo; Masiunjuti.

Distribution.—Nyasa Plateau (Zomba).

Palæozoic Pelecypoda.

Under this heading are included a number of natural casts of a small pelecypod shell belonging to Amalitsky's genus *Palæomutela*, and to the species *oblonga* of Prof. T. Rupert Jones, which the latter described some years since from specimens collected by the late Prof. H. Drummond at Maramura, west of Karonga on Lake Nyasa, and some 20 or 30 miles south of Nkana, whence the present material was obtained (see pp. 204, 207). The specimens occur in a blackish shale, associated with fish-scales and the remains of *Estheriella*. Parts of the same shale are of oolitic structure.

Palæomutela and its associate *Palæanodonta* belong to a series of freshwater or lacustrine pelecypods which are distributed through the lower portion of the Karroo System of South Africa, having been recognized at Beaufort, Bedford, Graaff Reinet, Kimberley, in Northern and Southern Rhodesia and North-Western Nyasaland.

Prof. Amalitsky has specially studied this molluscan fauna, and has noted its resemblance to that of the Permian beds of Russia, five species of the shells being determined as common to these two widely distant areas. The distribution of these genera is set out in a subsequent table (p. 246).

Genus *PALÆOMUTELA*, Amalitsky.

‘Ueber die Anthracosien der Permformation Russlands’ *Palæontographica*, vol. xxxix (1892) pp. 159, 199.

Types = *P. verneuili* & *P. keyserlingi*, Amalitsky.

Synonyms: *Iridina* (?) Sharpe, 1856; *Iridina* (?) T. R. Jones, 1890.

Distribution.—The Permian of Eastern Russia and the Karroo Formation of South Africa [= Permo-Carboniferous].

PALÆOMUTELA OBLONGA (T. R. Jones). (Pl. XIX, figs. 11–14.)

Tellinidæ (species of the), H. Drummond, ‘Tropical Africa’ 1888, p. 192.

Iridina (?) *oblonga*, T. R. Jones, *Geol. Mag.* 1890, pp. 556–57 (woodcut).

Palæomutela, W. Amalitsky, *Palæontographica*, vol. xxxix (1892) p. 159; and *Quart. Journ. Geol. Soc.* vol. li (1895) p. 341.

The specimens referred to this species are fairly well represented in a dark shaly matrix, but consisting chiefly of natural casts, like those originally described by Prof. Rupert Jones from Maramura, in which a dentition can be deciphered. With the view of testing the presence of teeth, on which the adoption of *Palæomutela* would depend as opposed to the edentulous genus *Palæanodonta*, a surface has been prepared of the dorso-posterior region of a right valve, showing a thickened hinge-plate anteriorly but becoming more slender towards the posterior end. The marginal lines of this hinge enclose a series of narrowly angulate and acute >-shaped teeth, generally suggestive of what is present in *Palæomutela*, although of greater obliquity (see Pl. XIX, fig. 13). On such evidence, the species *oblonga* is retained in *Palæomutela*, where Prof. Amalitsky grouped it when prosecuting his investigations on these freshwater shells without, however, the aid of dental characters at that time.

The valves vary in length from about 5 to 15 millimetres, being therefore somewhat smaller than those from Maramura, which exhibited a maximum length of 20 millimetres. One of the right valves still shows mineralized remnants of an external ligament reposing in a narrow elongate, lanceolate depression.

The specimens correspond with the original details of this species as expressed by Prof. Rupert Jones:—

‘The shells are oval-oblong, or sub-oblong, rounded at the ends unequally; the posterior being somewhat truncate, and the anterior obliquely truncate, with an ogee-curve below the umbo. Hinge-line long and straight; ventral margin slightly curved. Various degrees of imbedment affect the visible shape; some individuals showing only a triangular outline. The surface is moderately convex, and bears rather strong concentric lines of growth. These fossils have a general resemblance to the *Iridinæ* described and figured by D. Sharpe in the *Trans. Geol. Soc.* ser. 2, vol. vii, pp. 225, 226, pl. xxviii, figs. 2–4. These were from the Karroo Formation at Graaf-Reynet in the Cape Colony.’ (*Loc. supra cit.*)

The Maramura specimens were first referred to by their discoverer,

the late Prof. Drummond, in 1888, as 'a single species of the Tellinidæ,' which indicated a family of marine shells; but when they were subsequently examined by Prof. T. Rupert Jones, he was enabled to describe them as of freshwater origin under the genus *Iridina* (?). Later still, Prof. Amalitsky included the species of *Iridinæ* (?) of Sharpe and Jones in his genus *Palæomutela*, for which and other genera he founded the family name of Anthracosidæ or Palæounionidæ.

Several estuarine or freshwater mollusca are now recorded from the Karroo deposits of Africa, owing chiefly in more recent years to the researches of Prof. Amalitsky, who, after studying the types contained in the British Museum and in the collection of the Geological Society, relegated them to his new genera *Palæomutela* and *Palæanodonta*, and demonstrated their unmistakable resemblance to the Permian freshwater shells of Russia, five species being found alike in the two countries (see Distribution Table, p. 246).

Formation.—Permo-Carboniferous [Karoo Beds].

Localities.—Nkana (Andrew & Bailey); Maramura (Drummond).

Palæozoic Crustacea (Phyllopoda).

Genus ESTHERIELLA, C. E. Weiss.

Zeitschr. Deutsch. Geol. Gesellsch. vol. xxvii (1875) p. 711.

Type = *Posidonomya wengensis*, Giebel.

Distribution.—The Triassic of Saxony, etc.; Permo-Carboniferous of South Africa; and the Upper Carboniferous of Scotland.

ESTHERIELLA NYASANA, sp. nov. (Pl. XIX, figs. 15–18.)

Description.—Valves small, more or less depressed, oblong, narrow, sometimes subquadrate, moderately and regularly convex. Umbones antero-terminal. Dorsal line extended, straight, slightly oblique, nearly parallel with the ventral border; anterior margin truncated, straight; posterior margin with outward curvature. Ornamentation comprising about twelve equidistant concentric striations with a finer series occupying the interspaces, crossed by obscure radial riblets; surface more or less wrinkled, and covered with pittings or granulations.

Dimensions.—The valves measure about 1 millimetre in their longest axis.

Remarks.—At the reading of this paper before the Geological Society, I was under the impression that the obscure fossils now described might represent the embryonic condition of the associated shells of *Palæomutela* (?), and I therefore referred to them as belonging to the glochidial stage of that pelecypod. From a further study of the specimens, however, and assisted by some excellent *camera lucida* drawings made by Mr. Highley, I regret that I am no longer able to support so interesting an interpretation, being convinced that these little fossils are the carapace-valves of a phyllopodous crustacean generally known as the genus *Estheria*.

Although the specimens are very numerous, they appear to be referable to one particular species, and the presence of radial striations (see Pl. XIX, fig. 16) is sufficient evidence for regarding it as an example of *Estheriella*, a genus founded by Weiss to include Giebel's *Posidonomya wengensis* and allied species from the Bunter Sandstone of Saxony, which possessed the usual characters of *Estheria*, but in addition a radially striated sculpture.

Prof. Rupert Jones¹ has fully recognized the adoption of *Estheriella*, and, in a final paper² on the subject, alludes to the presence of radial striations on his species, *Estheria tegulata* and *E. tessellata* from the Upper Carboniferous of Scotland, the same character being strongly expressed in *Estheriella radiata* (Salinas) var. *multilineata*, Jones, from the Trias of the Malay Peninsula, and more feebly so in *Estheria greyi*³ from the Karroo of Cradock (South Africa).

The present species may be distinguished by the very anterior position of the umbones, the nearly parallel condition of the dorsal and ventral margins, and the truncated character of the anterior end. In such details it appears to be a form which need not be mistaken for any of those just mentioned, although in the clearly-cut arrangement of the concentric sculpture and in some of the valves showing a subquadrate contour, it somewhat resembles *Estheria greyi*. The integument of which these carapace-valves are composed is most delicate and thin, a feature which would account for their generally much wrinkled condition under pressure, resulting frequently in the obliteration of the extremely fine concentric striations which otherwise form part of the sculpture. The specimens also exhibit a glossy and iridescent aspect, indicating certain mineral characteristics which prevailed during the period of fossilization.

Formation.—Permo-Carboniferous [Karoo Beds].

Locality.—Nkana (Andrews & Bailey).

Conclusions.

- (a) The freshwater limestone of Chisali, containing remains of *Viviparus unicolor*, is evidence in favour of an extension in a north-westerly direction of the waters of Lake Nyasa during Quaternary times, for a distance of about 15 miles.
- (b) The Permo-Carboniferous shells of Nkana are of importance in joining up areas of similar age on the north-western side of Lake Nyasa; as, for instance, Maramura with Nkana, and the latter with the Kivera and Songwe-River regions (Kandete Bach, etc.) of German East Africa, where Dr. Bornhardt has recognized coal-bearing rocks with plant-remains (described by H. Potonié), which he refers to the Karroo formation.⁴

¹ Geol. Mag. 1891, p. 53.

² *Ibid.* 1905, pp. 50-52 & pl. ii.

³ *Ibid.* 1878, p. 100 & pl. iii, fig. 1.

⁴ 'Deutsch-Ost-Afrika', vol. vii (1900) pp. 495. 501 & geol. map No. 4.

TABLE SHOWING THE SPECIFIC DISTRIBUTION IN SOUTH AFRICAN LOCALITIES OF PERMO-CARBONIFEROUS PELECYPODA, BELONGING TO THE FRESHWATER GENERA *PALÆOMUTELA* AND *PALÆANODONTA*, AND THEIR OCCURRENCE IN DEPOSITS OF HOMOTAXIAL AGE IN EASTERN RUSSIA, AS RECOGNIZED BY PROF. AMALITSKY.

Genera.	Species.	Beaufort (= Balfour).	Bedford.	Graaff Reinet, Bloemkop, &c.	Kimberley.	Rhodesia.	Nyasaland.	Russia (E.).
<i>PALÆO- MUTELA</i>	<i>oblonga</i> (T. R. Jones)	...	...	...	...	...	×	
	<i>rhomboidalis</i> (Sharpe)	...	...	×	...	...		
	<i>ovata</i> (Sharpe)	...	...	×	...	...		
	<i>cf. ovalis</i> , Amalitsky	...	...	×	...	...		
	<i>semilunulata</i> , Amalitsky	...	...	×	...	...		×
	<i>plana</i> , Amalitsky	...	...	×	...	...		×
	<i>trigonalis</i> , Amalitsky	...	...	×	×	...		×
	<i>murchisoni</i> , var., Amalitsky	...	×	...	...	...		
	<i>cf. levis</i> , Amalitsky	...	×	...	...	...		
	Group <i>keyserlingi</i> , Amalitsky (W. Hind) } including <i>Cyrena? neglecta</i> , T. R. Jones }	×	...	×	...	×		
	n. sp., Amalitsky	...	...	...	×	...		
	n. sp. aff. <i>golouckinskiana</i> , Amalitsky	...	...	...	×	...		
<i>PALÆ- ANODONTA</i>	n. sp. aff. <i>orthodonta</i> , Amalitsky	...	...	...	×	×		
	(sp. (Molyneux)	...	...	...	...	×		
	<i>okensis</i> , Amalitsky	...	...	×	...	...		×
	<i>subcastor</i> , Amalitsky	...	...	×	...	...		×

HISTORY OF COLLECTIONS.

Localities (South Africa).	Collectors.	Where preserved.
Beaufort (= Balfour)	A. G. Bain and R. N. Rubidge.	Geological Society.
Graaff Reinet, Bloemkop, &c...		
Bedford	David Fraser.	British Museum (Natural History).
Kimberley	E. J. Dunn (probably).	
Rhodesia	A. J. C. Molyneux.	
Nyasaland	Henry Drummond, A. R. Andrew, and T. E. G. Bailey.	

Literature consulted.

- W. AMALITSKY. 'Ueber die Anthracosien der Permformation Russlands' *Palæontographica*, vol. xxxix (1892) pp. 159-60. [*Palæomutela* founded for Permian species from Russia and from the Karroo Beds of South Africa.]
- W. AMALITSKY.—'A Comparison of the Permian Freshwater Lamellibranchiata from Russia with those from the Karroo System of South Africa' *Quart. Journ. Geol. Soc.* vol. li (1895) pp. 337-49 & pls. xii-xiii. [*Palæanodonta* founded for species occurring in the Devonian, Carboniferous, and Permian Systems of Russia, etc., and South Africa.]

- A. G. BAIN. 'On the Geology of Southern Africa' Trans. Geol. Soc. ser. 2, vol. vii (1856) pp. 175-92. [Reptiliferous or Karroo deposits regarded as of lacustrine origin, and probably equivalent to the Carboniferous Series of Europe, including in it two new species of shells under the genus *Iridina* (?).]
- M. BLANCKENHOEN. 'Neues zur Geologie & Paläontologie Ägyptens: IV. Das Pliocän- & Quartärzeitalter' Zeitschr. Deutsch. Geol. Gesellsch. vol. liii (1901) p. 432.
- W. BORNHARDT. 'Deutsch-Ost-Afrika—Geologie' vol. vii (1900) p. 462. [Refers to H. Drummond's discovery of Karroo fossils (shells, fishes, etc.) in North-Western Nyasaland.]
- H. DRUMMOND. 'Notes on a recent Examination of the Geology of East-Central Africa' Rep. Brit. Assoc. (Aberdeen, 1885) 1886, p. 1032. [Mentions the occurrence at the northern end of Lake Nyasa of beds of uncertain age containing shells, etc., which are probably of lacustrine origin.]
- H. DRUMMOND. 'Tropical Africa' London, 1888, pp. 183-99. [Refers to a species of Tellinidae found in a shale at the northern end of Lake Nyasa—no statement as to geological age.]
- E. J. DUNN. 'Further Notes on the Diamond-Fields of South Africa' Quart. Journ. Geol. Soc. vol. xxxiii (1877) p. 880. [Freshwater shells found in Kimberley Mines at a depth of 120 feet.]
- G. R. VON FRAUENFELD. 'Beschreibung von sieben neuen Arten der Gattung *Vivipara*, Lam.' [Lake Nyasa, etc.] Verhandl. Zool.-Bot. Gesellsch. Wien, vol. xv (1865) pp. 531-33 & pl. xxii.
- F. H. HATCH & G. S. CORSTORPINE. 'The Geology of South Africa' London, 1905.
- WHEELTON HIND. 'Notes on some Lamellibranchiate Mollusca obtained by Mr. Molyneux from the Sengwe Coal-field' [Southern Rhodesia] Quart. Journ. Geol. Soc. vol. lix (1903) p. 287. [Records the occurrence of *Palaeomutela*, group *keyserlingi*, Amalitsky.]
- C. F. JICKEL. 'Fauna der Land- & Süsswasser-Mollusken Nord-Ost-Afrikas' Nova Act. K. Leop.-Carol. Deutsch. Akad. Naturforsch. vol. xxxvii (1874) p. 235.
- T. R. JONES. 'On some small Bivalve Shells from the Karroo Formation, South Africa' Geol. Mag. dec. iii, vol. vii (1890) pp. 409-10, woodcut on p. 558. [Describes and figures *Cyrena* (?) *neglecta*.]
- T. R. JONES. 'On some Fossils from Central Africa' Geol. Mag. dec. iii, vol. vii (1890) pp. 553-58, woodcut figure. [Describes and figures *Iridina* (?) *oblonga*.]
- G. LIEDER. 'Aus dem Deutsch-Ostafrikanischen Schutzgebiete' Mitt. Forsch. Gelehr. Deutsch. Schutzgeb. [Danckelmann, Berlin] vol. vii (1894) p. 272. [Alluvial deposits of northern coast of Lake Nyasa referred to, but no mollusca mentioned.]
- E. VON MARTENS. 'Beschalte Weichthiere Ost-Afrikas' Deutsch-Ost-Afrika [K. Möbius] vol. iv (1898) pls. i-vii, pp. 46, 175-177. [Describes *Viviparus unicolor* var. *jeffreysi*, *Martensia mozambicensis*, etc.]
- A. J. C. MOLYNEUX. 'The Sedimentary Deposits of Southern Rhodesia' Quart. Journ. Geol. Soc. vol. lix (1903) pp. 266-85. [Refers on p. 283 to unioniform shells in the Matobola Beds, regarded as of Permo-Carboniferous age.]
- A. J. C. MOLYNEUX. 'On the Karroo System in Northern Rhodesia, & its Relation to the General Geology' Quart. Journ. Geol. Soc. vol. lxxv (1909) pp. 408-38. [Refers to the occurrence of *Palaeomutela* and *Estheria* in the Matobola Beds of this region, pp. 428, 429.]
- A. MORELET. 'Séries Conchyliologiques, comprenant l'Énumération de Mollusques Terrestres & Fluviales, &c. Pt. 2. Iles Orientales de l'Afrique' 1860, pl. v, fig. 5, p. 72. [*Glandina boivini*.]
- G. A. OLIVIER. 'Voyage dans l'Empire Othoman, l'Égypte & la Perse' [Paris] 1804 (= An xii). Atlas, pl. xxxi, fig. 9 & vol. iii, p. 68.
- L. PFEIFFER. 'Descriptions of Forty-seven New Species of *Helicea* from the Collection of H. Cuming, Esq.' Proc. Zool. Soc. Lond. 1855, p. 91 & pl. xxxi, fig. 9. [*Helix mozambicensis*.]
- A. W. ROGERS. 'An Introduction to the Geology of Cape Colony; with a Chapter on the Fossil Reptiles of the Karroo Formation, by Prof. R. Broom' London, 1905.
- D. SHARPE. 'Description of some Remains of Mollusca from near Graaf Reinet' [South Africa] Trans. Geol. Soc. ser. 2, vol. vii (1856) pp. 225, 226 & pl. xxviii, figs. 2-4. [*Iridina* ?]
- E. A. SMITH. 'On the Shells of Lake Nyassa, &c.' Proc. Zool. Soc. Lond. (1877) 1878, p. 716 & pl. lxxiv, figs. 10-11. [*Lanistes solidus*.]
- E. A. SMITH. 'Diagnoses of New Shells from Lake Tanganyika & East Africa' Ann. & Mag. Nat. Hist. ser. 5, vol. vi (1880) p. 428. [*Achatina kirkii* = *A. craveni*.]

- E. A. SMITH. 'On a Collection of Shells from Lakes Tanganyika & Nyassa & other Localities in East Africa' Proc. Zool. Soc. Lond. 1881, p. 283 & pl. xxxiii, fig. 11. [*Achatina craveni*.]
 E. A. SMITH. 'On a Collection of Land-Shells from British Central Africa' Proc. Zool. Soc. Lond. 1899, pp. 579-92 & pls. xxxiii-xxxv. [*Pomatias nyasanus*.]
 R. TATE. 'On some Secondary Fossils from South Africa' Quart. Journ. Geol. Soc. vol. xxiii (1867) p. 143. [Karoo shells from Kat River and Graaf Reinet are referred to, and regarded as of Triassic age.]

EXPLANATION OF PLATE XVIII & PLATE XIX (*pars*).

PLATE XVIII.

[The figures on this plate are of the natural size, with the exception of fig. 5, which represents a magnification.]

Quaternary Gastropoda.

VIVIPARUS UNICOLOR (Olivier).

- Fig. 1. An example of the limestone from Chisali, composed entirely of the casts of this gastropod. Natural size.
 2. Wax reproduction of specimen made from the largest cavity represented on surface of fig. 1.
 3. Front view of an isolated form from Chiwondo. Natural size.
 4. Dorsal aspect of same specimen.
 5. Surface of same, showing striated sculpture, magnified.

LANISTES SOLIDUS, E. A. Smith.

- Fig. 6. Front aspect of a medium-sized example from Chiwondo. Natural size.
 7. Dorsal view of the same specimen.

TROPIDOPHORA NYASANA, E. A. Smith.

- Fig. 8. Example of an adult form from Chiwondo, exhibiting a front view. Natural size.
 9. Dorsal aspect of the same shell.

PLATE XIX (*pars*).

[Figs. 13-18 have been drawn with the aid of the *camera lucida*, and are magnifications.]

Permo-Carboniferous Pelecypoda.

PALÆOMUTELA OBLONGA (T. R. Jones).

- Fig. 11. External view of two right valves of different sizes attached to the matrix. Natural size.
 12. Similar view of another right valve, showing the periodical growth-lines and fine intermittent striations. $\times 2$.
 13. Section of the posterior portion of the hinge-area of a fragmentary right valve, showing a succession of shell-growths forming narrow, elongate, >-shaped teeth. $\times 8$.
 14. Dorsal aspect of the specimen represented by fig. 12, exhibiting the segmented mineralized remains of the ligament reposing in the elongate posterior depression. $\times 8$.

Permo-Carboniferous Crustacea (Phyllopoda).

ESTHERIELLA NYASANA, sp. nov.

- Fig. 15. External view of a pair of extended valves showing oblong form. $\times 8$.
 16. Enlargement of the same specimen, exhibiting growth-lines and obscure radial striations. $\times 30$.
 17. An example of a right valve of subquadrate contour. $\times 8$.
 18. Profile of a specimen with closed valves, showing moderate and regular convexity. $\times 8$.

P. Highley del. et lith.

West, Newmar. imp.

QUATERNARY NON-MARINE GASTROPODA FROM NYASALAND.