of the gas from the iron be due to the fine state of division of the metal operated upon? In the case of the Texas and Tazewell irons, where the yield of gas exceeded that obtained from the Lenartó and Augusta Co. irons, the metal was in very small pieces, which would favour a more rapid and complete evolution of the gas; in the last-mentioned instances they were *en bloc*. That iron may under certain conditions, as when deposited by electrolysis, take up nearly two hundred and fifty times its volume, has been shown by the recent researches of Cailletet.¹ An observation recently made has a bearing on this question. While analysing a specimen of silver amalgam, I endeavoured to remove the mercury from a weighed fragment of the mineral by heating the specimen in a hard glass tube, during more than five minutes in the flame of the table blowpipe. The silver immediately fused and remained during that time in a molten state. When cold, the globule of metal was flattened into a plate, and having cut it into strips, and subjected it to a second heating, I succeeded in removing a considerable part of a per cent. of mercury from it.

Wright's researches on the gases of meteoric irons have shown a varying character in the oxygen and nitrogen lines when in the presence of hydrogen, and the near coincidence of two of them with prominent lines in the corona, with the possible coincidence of a third line, which appears to indicate that the characteristic lines in the coronal spectrum are due, not so much to the presence of otherwise unknown elements, as to hydrogen, and the atmospheric gases oxygen and nitrogen.

The observations were made with a spectroscope of six prisms with a repeating prism, giving the dispersion of twelve in all.

(To be continued in our next Number.)

VI.—ON THE OCCURRENCE OF NEOCOMIAN SANDS WITH PHOSPHATIC NODULES AT BRICKHILL, BEDFORDSHIRE.

By WALTER KEEPING,

(Of the Woodwardian Museum), Christ's College, Cambridge.

IN a traverse through part of Buckinghamshire and Bedfordshire last vacation, with the object of tracing the extent of the Cambridge Greensand, I was informed of some recently opened Coprolite works at Brickhill, near Bletchley. On further inquiry, they proved to be the "red coprolites," a term applied by the workmen to the phosphatic nodules of the Neocomian like those of Potton and Upware (the Cambridge Greensand and Gault nodules being known as the "black coprolites").

The workings are seen on a hill near Great Brickhill, which is about three miles from Bletchley Junction, and the section exposed is about thirty feet deep. The deposit is a rather coarse sand throughout, composed of grains of quartz, lydian stone, and comminuted shells,

¹ L. Cailletet. *L'Institut*, Nouv. Sér. iii. 44.

sometimes hardened by iron oxide or calcium carbonate; the former along lines of oblique lamination, the latter usually in irregular masses, which are rejected as useless. As I saw it, the lower ten feet was of a dull greenish or grey colour, passing in an irregular manner into the redder portions above; but there is no definite divisional line separating the two, the difference in colour being probably due to the oxidation of the iron in the more superficial part.

As at Potton, these sands repose upon the Oxford-clay, the *Gryphea dilatata* being abundant in the clay beneath.

Unlike any other coprolite working known to me, there is no "seam" here, but the phosphatic nodules are scattered through the entire thickness of the section,¹ and they are separated by sifting the whole of the thirty feet of sands, except where they are too much hardened by cementing substances. Thus separated, the coprolites are washed in revolving perforated cylinders, and any pebbles of quartz, chert, lydian stone, etc., are picked out when the material is ready for grinding. The whole process is the same as that carried on at Potton in Bedfordshire and Upware near Cambridge.

From Palæontological evidence, we have long believed the Upware deposit (which has already been described in the pages of this MAGAZINE²) to be the representative of, if not continuous with, the Farringdon Sponge-bed. Now Brickhill is nearly equally distant from Upware and Farringdon; here then is the spot to settle the question of their relation.

The phosphatic nodules of Upware occur in the Neocomian Sands in three seams, which are irregular and sometimes run together,³ and in the Rushmoor Brickyard,⁴ a few miles from Brickhill, the "coprolites" may be seen similarly collected into a bed from four to seven feet thick, resting on the Oxford-clay. At Farringdon coprolites are found scattered through the sands, especially towards the base.

But few fossils are to be seen among the prepared coprolites, and these are mostly phosphatised casts in a much worn condition, so that a glance at the heap would lead one to observe with the Rev. P. B. Brodie,⁵ when speaking of the Potton bed, that "every organism in this phosphatic bed is evidently extraneous." *Ammonites biplex* is always the conspicuous fossil in this condition, together with *Cardium striatulum*, *Arca*, and *Myacites*, all of which I found at Brickhill.

But on breaking open the hard masses cemented by the carbonate of lime, and also in a small patch of the section where calcareous matter remained, the natives of the bed were themselves found, still with their shells well preserved, and in general appearance closely resembling those of Upware. The following is a list of them.⁶

¹ In the lower part they are more numerous and blacker.

² J. F. Walker, *GEOL. MAG.* 1867, Vol. IV. p. 309.

³ Walker, *op. cit.* p. 310.

⁴ I was informed that about four years ago they bored for coal in this yard!

⁵ *GEOL. MAG.* 1866, Vol. III. p. 153.

⁶ Mr. J. F. Walker has kindly examined and confirmed my identifications of those species described by him in the *GEOL. MAG.* Vol. IV. p. 454; Vol. V. p. 399.

Those marked U, are known to occur at Upware, near Cambridge ;
F, at Farringdon.

- Terebratula praelonga* (Sow.), U, F.
 „ *depressa* (Lam.), U, F.
 „ *Moutoniana* (d'Orb.), U, F, small and striated variety.
 „ *microtrema* (Walker), U.
 „ *sella*, var. *Tornasensis* (d'Arch.), U, F.
 „ *extensa* (Meyer), U.
 „ *Seeleyi* (Walker), U.
Waldheimia Wanklyni (Walker), var. *elliptica*, U.
 „ *pseudopurensis*¹ (Leym.), U, F.
Terebratulina oblonga (Sow.), F.
Terebratulina striata (Wahl.), var. *elongata* (Dav.).²
Rhynchonella Cantabridgiensis (Dav.), U.
 „ *Upwarensis* (Dav.), U.
 „ *antedichotoma* (Buv.), U, F.
 „ *depressa* (Sow.), U, F.
 „ *latissima* (Sow.), F.
Ostrea macroptera (Sow.), U, F.
Lima Farringdonensis (Sharpe), F.
 „ *Dupiniana* (d'Orb.), (?).
Cidaris Farringdonensis (Wright), ? F.

This list is extremely interesting, as being intermediate between the two remarkable and isolated faunas of Upware and Farringdon;³ for of the twenty species enumerated, no less than fourteen are common to Upware, twelve occur at Farringdon, and seven are found in all three localities. *Terebratula microtrema*, *T. Seeleyi*, *Waldheimia Wanklyni*, *Rhynchonella Cantabridgiensis*, and *R. Upwarensis* were hitherto unknown out of the Upware deposit.

It may be found necessary to separate the specimens which I have named *T. Moutoniana* as a variety of that species, differing as it does from the type in being smaller and distinctly striated.⁴ We may call it *Terebratula Moutoniana*, var. *Brickhillensis*.

It is conspicuous that the sponges so remarkably developed at Upware and Farringdon are absent from this list; this is, I think, accounted for by the want of calcium carbonate, such as might have been supplied by the Coral-rag of Farringdon and the Coral-reef of Upware. In the sands of both these localities fragments of the Coral Limestone are abundant; and I observed, when the fine series from Upware was being collected for the Woodwardian Museum, that nearly all the sponges were found close to the Coral-reef. Lately, since the workings have been removed only 200 or 300 yards further off, where the bed rests on the Kimmeridge-clay, sponges occur but rarely.⁵

The coprolites at Brickhill are of the same type as those of

¹ Mr. Walker informs me that this species has lately been also met with at Folkestone.

² I am indebted to Mr. Davidson for this identification. He informs me that "the same variety occurs in the Bargate stone (Upper Neocomian) of Guildford and Godalming in Sussex."

³ I hope to be able to add to this list as the workings go on, the result of which may prove worthy of another communication to this MAGAZINE.

⁴ Faint striae have been observed on some of the Upware specimens. See Mr. J. F. Walker's article in GEOL. MAG. 1868, Vol. V. p. 403, Plates XVIII. and XIX.

⁵ My father has since obtained for the Woodwardian Museum a few sponges from Brickhill.

Upware and Potton, viz. the light yellow varying to dark brown, almost to the black type, much worn *before they reach the mill*,¹ and perforated by lithophagous mollusca and annelids. They contain (at Potton) about 48·51 per cent. of phosphate of lime.²

In conclusion, I may remark on the wide distribution of these Neocomian “coprolites.” They occur at Farringdon, Brickhill, Rushmoor, Potton, Upware, and I have lately found them in the Upper Neocomian Sands of Lincolnshire. In all these places they are of the same type, much worn and drilled, and abounding with *Ammonites biplex* and other Kimmeridge-clay forms. This fact of the Kimmeridge-clay origin of so many of these “coprolites” is of importance in considering the origin of the phosphatic matter; for since we do not find the fossils in this phosphatised condition abundantly in the Kimmeridge-clay, while they are invariably so over a wide extent of country as derivative fossils in the Neocomian, we may infer that the phosphate was obtained in the latter period; in other words, as suggested by Mr. Walker,³ that the coprolites are nodules derived from the Kimmeridge-clay, which have been “soaked” with phosphates obtained by the decomposition of animal and vegetable matter in a shallow sea,⁴ with, perhaps, some replacement of the phosphate of lime for carbonate of lime.

I may observe also that at Potton fossils in this eroded condition occur of the Portland and Wealden ages—notably the *Endogenites erosus* of the Weald—indicating, as I believe, the former extension of these deposits near, if not quite up, to this locality.⁵ Further north, at Upware, *Endogenites erosa* has not, to my knowledge, been found, and the Dinosaurian remains are much less frequent; so that the northern limit of the Wealden may reasonably be fixed at some place not far from Potton.⁶

REVIEWS.

I.—THE PAST AND FUTURE OF GEOLOGY. An Inaugural Lecture given by JOSEPH PRESTWICH, M.A., F.R.S., F.G.S., etc., Professor of Geology in the University of Oxford, January 29, 1875. pp. 48, with four illustrations. (London: Macmillans.)

MR. PRESTWICH, after paying a just compliment to Oxford by noting how much the infancy of modern Geological Science was indebted to the labours and discoveries of Kidd and Buckland,

¹ The eroded appearance of the Cambridge coprolites has frequently, and to a great extent incorrectly, been referred to the attrition produced by washing in the mills.

² Vide analysis by Dr. Voelker, *GEOL. MAG.* 1866, Vol. III. p. 154.

³ *Ann. Nat. Hist.* Nov. 1866.

⁴ This theory has no reference to the nodules of the Gault and Cambridge Greensand, which are far too pure for such an origin.

⁵ Professor Morris has already (*GEOL. MAG.* Vol. IV. p. 459) from similar evidence stated his conviction that the Wealden beds were present over the neighbourhood of Aylesbury.

⁶ M. J. Harris Hall, of St. John's College, informs me that he found coprolites scattered over this hill at Brickhill about two years ago. The result of his inquiry into the Potton and Upware deposits (*Sedgwick Prize Essay*) will be published very soon.