

subsidence having continued to the level of the present raised beaches, relevation took place, producing greater cold and more extreme seasons, and culminating in the production of continental conditions, permitting the southward migration of a temperate fauna, and the advent of one requiring greater cold. During this period the gravels connected with the formation of the present valley system, the raised beaches, and the "Head" were produced, and, doubtfully, part of the cave-earth and the granular stalagmite of Kent's Cavern, and the clay of Petrockstow and Roundswell. In the last subperiod the author considered that a subsidence took place during which most of the valleys were excavated to their present depth, and forest growth took place upon the old marine plain; the forests were then gradually circumscribed by the encroaching sea and diminishing rainfall, which also led to changes in the streams, and finally the sea entombed the forests and swamps on the coasts, and produced the present cliff-line. The results of this period are the submarine forests, most of the river-valley gravels, and alluvial tracts bordering the present river-courses.

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### CORRESPONDENCE.

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#### THE CORAL RAG OF UPWARE.

SIR,—In the October Number of the GEOLOGICAL MAGAZINE Professor Bonney points out certain facts observed originally by Mr. Henry Keeping—but subsequently confirmed by himself—which are, he considers, incompatible with "the *presumed* section" near Upware given in our paper "On the Corallian Rocks of England," Quart. Journ. Geol. Soc., vol. xxxiii. p. 315.

Our object in attempting the section referred to was to show how the palæontologically higher beds of the south pit could overlie those of the north pit—though they dip towards them; and that they may do so, unless we call in the aid of a fault, the existence of a synclinal is the most natural supposition. Beyond this, the stratigraphy was irrelevant to our paper—and we readily admit that the unconformity between the Corallian rocks and the newer strata might have been more clearly shown. We would merely remark that Mr. Keeping's section, being at right angles to ours, can throw no light on its correctness.

The true reading of the sequence of the Corallian rocks—which, as indicated in column ix. of our table of comparative sections, is not seen—rests entirely on palæontological evidence, and this, though he admits that we may be right "in assigning to the rock of the northern pit a lower horizon than that of the southern," Professor Bonney considers not to be strong. Here then is the only point really at issue between us. We can only say that the two urchins which by their abundance characterize the northern pit, are "species usually indicative of a low position" (see our memoir, p. 367), and their occurrence on or above the horizon of a Rag fauna would be another of those surprises with which we will admit the Corallian series abounds.

The second portion of Prof. Bonney's paper relates to another matter; and here let us at once express our regret that any phraseology of ours should even seem to imply that the Coral Rag of Upware had been "imperfectly" treated in his "Geology of Cambridgeshire." Having said this, we will proceed to discuss the substance of his complaint. The chief points in which our account differs from that of Prof. Bonney are the assignment of the Upware rock of the south pit to the Coral Rag in a restricted instead of a general sense; and the separation of the north pit rock as belonging, not to a mere variation of development, but to a different horizon. That Prof. Bonney called the Upware rock "true Coral Rag, as the word was then understood," was clearly acknowledged in the sentence following the one he quotes, viz. "It has always been called Coral Rag, except by Mr. Seeley." But Prof. Bonney went further. He attempted to show to *what part* of the "Coral Rag as then understood" the Upware rock belongs. He assigned it to the lower part, and therefore to an horizon *beneath* our restricted "Coral Rag";<sup>1</sup> and it is on this point that we differ from him. He did this on account of its containing *Cidaris florigemma*, which he says extends down to the Lower Calcareous Grit. We ask, where? Not, we venture to say, in England.

To prove a negative is of course a difficult task, and the experience of years may be upset by the discovery of a moment. But the fact is that *Cidaris florigemma* hardly ever occurs even in the Coralline Oolite, which in nearly every locality where a sequence can be traced is interposed between the Coral Rag and Lower Calcareous Grit. So far, then, from making the position of this urchin less constant than it was supposed to be, as is alleged by Prof. Bonney in the second paragraph of his letter, our intentions were certainly in a contrary direction, only we find it constant in the *upper* and not in the lower part of the series; or, to speak more accurately, it is most plentiful in the lower portion of the upper division, *i.e.* the restricted Coral Rag. If, however, English geologists are content to derive their impressions of the distribution of the Mesozoic strata of their own island from the detailed accounts of their supposed foreign equivalents by continental authors, we can never get any real data for comparison. In the present instance it would appear that the *Cidaris florigemma* was contemporary with the earlier part of the Coral growths in Eastern France. In the Boulonnais it was pretty uniformly distributed throughout, as M. Rigaux informs us, and he therefore wonders that we consider its position so constant. In England again, except in the Weymouth area, which shows more intermediate conditions, it is almost entirely confined to the uppermost Coral growths. The lower reefs at Highworth and Hackness, though presumably formed under similar physical conditions, are

<sup>1</sup> It may be necessary here to remind the readers of the GEOL. MAG. that the Corallian of England admits of four primary subdivisions, as follows in descending order: 1. Supracoralline, or equivalents of the Upper Calcareous Grit; 2. Coral Rag, or zone of *Cidaris florigemma*; 3. Coralline Oolite, or zone of *Am. plicatilis*; 4. Lower Calcareous Grit, or zone of *Am. perarmatus*.

without it. Whether we are to consider that Coral growth began earlier in England than in France, or that *Cidaris florigemma* reached us later, is an interesting question; but this much is certain, that the Coral growths continued to a much later period in Eastern France; hence the idea that *Cidaris florigemma* is indicative of a low Corallian horizon. In the discussion on our paper, Professor Morris pointed out that "the so-called Corallian occupied different zones in different localities on the Continent, stretching, in fact, from the Oxfordian to the Portlandian inclusive." Correlation, to be of any value, therefore, is only to be effected by a detailed examination of both the English and continental areas, without confounding together either the beds of different districts, or those of the same district, as is generally done in all works dealing with the subject.

LONDON, Dec. 6, 1877.

BLAKE AND HUDDLESTON.

P.S. The great stretch of country passed under review in the "Corallian Rocks of England" obliged us to condense lists of fossils as much as possible. Had we given a full list of fossils from the North Pit, it is difficult to see that any doubt as to its age could exist. The following, omitting certain indefinite forms, is as full a list as we have been able to put together:

<i>Ammonites perarmatus</i>	<i>Isocardia</i> (cast)
" <i>plicatilis</i>	<i>Pygaster umbrella</i>
<i>Littorina muricata</i> (var.)	<i>Echinobrissus scutatus</i>
<i>Pleurotomaria</i> (cast)	<i>Holectypus depressus</i>
<i>Gervillia aviculoides</i>	<i>Collyrites bicordatus</i>
<i>Opis Phillipsi</i>	

Only three of these occur in the South Pit.

B. & H.

#### CYCADACEOUS PLANTS OF THE DAMUDAS.

SIR,—I beg you will allow me space to correct some erroneous impressions that might be made by certain not sufficiently explained statements published by me in the GEOLOGICAL MAGAZINE, and elsewhere, and to apologize to the gentlemen whom I thereby have had the misfortune to offend. I beg to state that any such effect was as far from my intention as it certainly would be contrary to my interests, and I regret that, when stating facts, I did not more fully notice circumstances that would only be known to those immediately concerned.

The following instances will sufficiently explain this unfortunate misunderstanding.

When writing in the GEOLOGICAL MAGAZINE in November, 1876, p. 489, on the occurrence of Cycadaceous plants in the Damudas, saying in footnote No. 10 "that they were known long ago," I ought to have explained that the two species (out of three) I mentioned, *i.e.* *Nöggerathia*, near *Vogesiacca* and *Glossozamites*, although collected some years since, have not before been determined as such, and only *Nöggerathia*? *Hislopi* was by its describer (Sir Ch. Bunbury) considered as doubtfully Cycadaceous, and I see now that my footnote, No. 10, should have been written thus: "that Cycadaceous plants