take the beds now forming in the Black, Caspian, and Mediterranean Seas, and calculate their age from the sum of their thicknesses. This I believe has been a frequent source of error in estimating geological time, and it would be easy to give many illustrations of this from other beds.

Thirdly, Mr. Reade supposes the denudation of sedimentary rocks would reduce the mean thickness. This could only be the case if the area of deposition were continually changing its site or increasing its area. It is true that any given sediment *may* be spread over a wider area than the material originally occupied (though this is probably only the case in fluviatile beds), but as a broad fact the area of the land—or denuded surface—is greater than the area of deposition, as we know that all sediment is thrown down near the shore. We must treat this question as a whole, and not take isolated facts. Moreover, we believe the actual area of deposition not only is not increasing, but, viewed on as large a scale geologically as we have just done geographically, remains practically the same. Hence every ounce of freshly denuded igneous rock swells the actual thickness, and no amount of redistribution can reduce it, as Mr. Reade seems to think.

Supposing, lastly, that Mr. Wallace's calculations were all wrong, and Mr. Reade's curious figures (such as $\frac{1}{9}\frac{2}{3}\frac{2}{6} = 777$) all right, it does not touch the main point at issue, namely, the question of the permanency of oceanic areas. I have not yet seen a single fact that tells against this view. SYDNEY B. J. SKERTCHLY.

THE OLIGOCENE STRATA OF THE HAMPSHIRE BASIN.

SIR,—Your correspondent, Mr. Henry Keeping, is quite in error in supposing that in any remarks made at the Geological Society I had any desire to question the general excellence of his memory. The principle on which I did insist—and it is one which I am sure will command the assent of all geologists—is this, that when we have the observations of competent investigators carefully recorded on the spot, these ought not to be lightly set aside in favour of other observations, quoted from memory only, after an interval of thirty years. Under similar conditions, I should be quite as ready to distrust my own memory as I am that of your correspondent.

The case in question stands as follows:—Webster and Lyell, in their accounts of Hordwell Cliff, did not notice the so-called "Upper Marine Band." It appears to have been first discovered by the late Mr. F. Edwards, about the year 1840. In 1846 the late Mr. Searles Wood, who worked in conjunction with its discoverer, gave a full description of the bed and described it as being clearly underlaid and overlaid by freshwater strata. Dr. Wright, who described the section in 1851, and the late Marchioness of Hastings, who published her final account in 1853, independently studied the section, and both of them assert that the marine bed was covered with freshwater strata, the thickness and succession of which they minutely describe.

Now both the last-mentioned authors state that they employed your correspondent to assist them in exposing and measuring the

https://doi.org/10.1017/S0016756800167159 Published online by Cambridge University Press

several beds. Mr. Keeping says that he suspected at the time that the "Marine bed" was not in place, and that he spoke to both Dr. Wright and the Marchioness of Hastings on the subject. As both of these authors describe the bed in regular sequence, and enumerate a number of freshwater strata as lying unequivocally above it, is it not clear that they, after a careful examination of the question, regarded the objections of your correspondent as unfounded?

In 1881 Mr. Keeping stated that the Marine bed at Hordwell had not been seen for twenty-eight years. This statement, though not literally correct, may be taken as sufficient evidence that since the date when the Marchioness of Hastings' description was written, your correspondent has had no opportunity of correcting or confirming his early impressions.

For thirty years and upwards, the statements of Mr. Searles Wood and Mr. Frederick Edwards, of Dr. Wright, and of the Marchioness of Hastings, that the Marine bed was overlaid by freshwater strata, has remained unchallenged and uncontradicted, and has been quoted again and again. Now, when most of the original observers have passed away, your correspondent comes forward and would have us believe that they all committed a most egregious blunder, and this in spite of distinct warning on his part.

Now for the accuracy of your correspondent's recollections. He states that when described by Mr. Searles Wood, the marine bed was a patch "just above high-water mark, and only extending some 20 yards in length." Mr. Searles Wood, writing in 1846, with the section before him, says, "The bed occurs at an elevation of ten or twelve feet above high-water mark, and only traceable for about forty yards." But he also states that when the bed was first discovered by Mr. F. Edwards, it could be followed for three hundred yards, though it soon became so covered by debris from above, that three years after, when he himself first visited it, the bed could not be traced for a third of this distance.

Am I wrong, under such circumstances, in appealing to geologists not to set aside as unworthy of credence the carefully recorded observations of very competent observers, in favour of the crude recollections of your correspondent?

The importance of this so-called "marine-band," which is only nine inches in thickness, has been much overrated. It is not a distinct formation, as your correspondent would have us believe, but only one of numerous local intercalations of brackish-water bands, among the Oligocene strata of this area. When Mr. Keeping undertakes in twenty minutes to convince me of the identity of this insignificant bed with certain strata, themselves very inconstant, on the opposite side of the Solent, he certainly overrates his powers of persuasion or my faculty of belief.

Your correspondent is also mistaken in supposing that I am the authority for the statement that the coast at Hordwell is receding at the rate of a yard per annum. The estimate of the rate of loss of this part of the coast was made by a very competent observer, Mr. Codrington (Q. J. G. S. vol. xxvi. p. 532). Every one who knows

https://doi.org/10.1017/S0016756800167159 Published online by Cambridge University Press

how Hordwell Church has had to be rebuilt inland, and who remembers how the old site of the churchyard is near the edge of the present cliff, will be surprised to hear that in this part the coast is not receding at all.

I may perhaps be allowed to take the present opportunity of recording one or two new facts concerning the interesting Oligocene strata of the Hampshire basin. A year or two ago I discovered a single vertebra of a true Cetacean in these strata, and the bone was described by Prof. Seeley. Prof. van Beneden has now recorded the discovery of vertebræ, similar in many respects to the British specimen, in strata of the same age at Helmstedt. These two examples are probably the oldest known non-zeuglodont Cetaceans. Hitherto no Bryozoa have been recorded from the British Oligocene; but recently Mr. F. Chapman, one of the staff of the Geological Laboratory here, has found on oyster shells from Colwell Bay a form regarded by Mr. Vine as identical with the *Membranipora Lacroixi*, which Mr. Busk found encrusting shells from the London Clay.

JOHN W. JUDD.

SCIENCE SCHOOL, SOUTH KENSINGTON, S.W.

THE MIDDLE HEADON MARINE BED AT HORDWELL.

SIR,—Mr. H. Keeping, of Cambridge, has asked me to send an account to your MAGAZINE of some work we have been doing together at Hordwell Cliff, Hants; viz. the re-opening of the Middle Headon Marine bed.

This bed has not been seen *in situ* here for upwards of thirty years, it having been obscured by talus from the superincumbent gravel, and its exact position has been disputed.

The earlier writers on this subject state that it underlies many feet of freshwater strata. This appears to be an error due to the fact that the bed seen by them was a slip close to the shore. Mr. Keeping opened the bed in its true position many years ago, and has now succeeded in finding it again. The spot selected by him for the digging is situated on the west side of a pathway down the cliff called "Paddy's Gap," about 600 steps to the east of the boundary bank between the Hordwell and Newlands estates, which is marked on the road running close to the cliff by a gate-lodge.

A pit eight or ten feet deep having been sunk through the talus, the following section was obtained:—

1. Soil, 1 foot.
2. Gravel, 25½ feet. The gravel immediately over the Tertiary beds is stained a very dark brown colour, with iron oxide.
3. Whitish sand, 1 foot to 1½ ft.
4. Marine bed, 1 foot to 1½ ft. Sand and comminuted shells, containing an abundant fauna chiefly of small and minute species of mollusca, estuarine and marine, including such common and characteristic species as the following:—*Pisania labiata, Murex sex-dentatus, Cancellaria muricata, C. elongata, Scalaria lævis, Nerita aperta, Neritina concava, Cerithium*

https://doi.org/10.1017/S0016756800167159 Published online by Cambridge University Press