

cemented into a more compact rock. I carefully watched the habits of the two species most numerous on the "flats," and in no case did I observe a single individual browsing on the patches of living coral. In truth it was on the dead coral rock forming the "flats" of these reefs that these two species of *Holothuræ* subsisted; and it appeared to me that they selected those feeding-grounds where the attachment of molluscs, zoophytes, and stony algae had to some degree loosened the surface of the rock.

The particular species, on which my observations were made to determine the amount of coral sand daily discharged, possessed a bluish-black body, from 12 to 15 inches in length when undisturbed, and with a circle of 20 palatine tentacles around the mouth. Without going into all the details of my methods of investigation, it will be sufficient to state that from three independent observations on this species of *Holothuria* I have placed the amount of coral sand daily voided by each individual at not less than two-fifths of a pound (*avoirdupois*). At this rate some fifteen or sixteen of these animals would discharge a ton of sand from their intestinal canals in the course of a year, which represents about 18 cubic feet of the coral rock forming the "flat" on which these creatures live. In order to illustrate this point more clearly, I will assume that every rood of the surface of the "flat" supports some fifteen or sixteen *Holothuræ*, a number which errs rather on the side of deficiency than of excess. In the course of a year 18 cubic feet of coral rock will be removed in the form of sand from the surface of each rood, which is equal to the removal of 1-605th of a foot per annum, or 1 foot in about 600 years.

Although this estimate can be only regarded as of a tentative character and as applicable to but one species of the *Holothuræ*, it nevertheless throws some light on what I may term the "organic denudation" of coral reefs, and it is not unreasonable to suppose that where a fringing reef is undergoing a very gradual up-heaval, the combined operation of the fish, the mollusc, the annelid, and the echinoderm, may prevent it from ever attaining an elevation above the level of the sea at high water.

H. B. GUPPY

H.M.S. *Lark*, St. Christoval, Solomon Islands, June 30

#### Railway Geology—a Hint

IT must often have occurred to others as well as to myself when making a long journey by rail, and being whirled along all too fast through section after section of the greatest interest to the eye that can see in them something more than mere railway "cuttings," how valuable would be some handbook giving the geological features of the country traversed by the principal railway lines, and illustrated by clearly drawn maps and sections.

To give an instance—I have occasion pretty often to travel by the South Western line from Waterloo Station to Exeter, a route along which my untrained eye can take note of a succession of instructive pictures, in the course of a five hours' journey—the recent gravels, &c., covered by pine wood in the neighbourhood of Woking, broken abruptly at Basingstoke station by a section of the chalk, to be succeeded from here onwards to Salisbury by undulating downs of the same formation, bare of trees, and but sparsely inhabited; next, at the Yeovil junction, a sandstone quarry, riddled by martin's nests, presumably of oolitic age; then, between Axminster and Honiton the greyish blue of a cutting through the lias; to be finally succeeded, as I approach the term of my journey, by the rich red earths and loams of the new red sandstone.

Any other line, for instance, the Great Western, which runs parallel to that just instanced, would give equally varied pictures; and a copiously illustrated handbook, with notes explanatory, but as brief as possible—not only of the ground immediately bordering the line of rail, but of the general features of the neighbouring country within the range of the eye of the traveller, should surely, I venture to think, have a large circulation.

Will no geologist—a member of the Government Survey, for instance—undertake the task?

J. C. G.

New University Club, October 27

[We noticed a Guide of this kind for American railways in vol. xix. p. 287, and then suggested the utility of a similar handbook for England.—ED.]

#### Complementary Colours

I HAVE often noticed the complementary purple on the foam of the bluish-green waters of Alpine rivers. The waters of the

Lake of Geneva, and of the Rhone at Geneva, as is well known, are not bluish-green, but greenish-blue; but there also I have noticed what to my eye is exactly the same tint of purple on the foam.

JOSEPH JOHN MURPHY

Old Forge, Dunmurry, co. Antrim, October 28

#### Palæolithic River Gravels

THE recent articles and reports in your columns on the subject of Palæolithic river gravels bring three points strongly forward, viz. :—

1. The great number of "flint implements" and "flint flakes" found in the river gravels.

2. The presence in the same deposits of bones of recent and extinct Mammalia.

3. The entire absence of the bones of man.

Such being the uniform results of persevering researches extending now for more than twenty-four years, it is surely time to request anthropologists to give (1) some explanation of the remarkable absence of human remains in deposits containing so many objects considered to be of human manufacture, and (2) some proof that it is absolutely impossible for these so-called "flint implements" and "flint flakes" to have been formed by natural causes.

C. EVANS

Hampstead, October 18

#### LAVOISIER, PRIESTLEY, AND THE DISCOVERY OF OXYGEN

IT is a matter of very little importance whether Lavoisier actually obtained oxygen gas a few weeks or days before Priestley. The bare bald discovery of the gas is a very minor matter when placed in juxtaposition with the astounding revolution produced in chemistry by Lavoisier; with the admirable series of experiments, the acute reasoning, the elegant logical penetration, which enabled him to overthrow the theory of Phlogiston when literally all Europe supported it. The discovery of oxygen dims and pales before the development of the theory of combustion, the theories of acidification, of calcination, of respiration, and the introduction of exact quantitative processes and instruments of precision into chemistry.

But it matters much whether the fair fame of one of the noblest and wisest men in the long roll of illustrious natural philosophers is to remain with a grievous slur cast upon it. It matters much whether his reputation is to be blasted by the reproach that he claimed the discovery of oxygen, knowing well that Priestley had preceded him.

It is with a view of removing this slur upon the memory of the founder of modern chemistry, and certainly not with any thought of adding one iota to his long list of greater triumphs, that we have examined into the true bearings of the question.

First as to the accusations. Dr. Thomas Thomson, in his "History of Chemistry," 2nd edit., 1830, vol. ii. p. 19, writes: "Lavoisier, likewise, laid claim to the discovery of oxygen gas, but his claim is entitled to no attention whatever, as Dr. Priestley informs us that he prepared this gas in M. Lavoisier's house in Paris, and showed him the method of procuring it in the year 1774, which is a considerable time before the date assigned by Lavoisier for his pretended discovery." Again, p. 106: "Yet in the whole of this paper the name of Dr. Priestley never occurs, nor is the least hint given that he had already obtained oxygen gas by heating red oxide of mercury. So far from it, that it is obviously the intention of the author of the paper to induce his readers to infer that he himself was the discoverer of oxygen gas. For after describing the process by which oxygen gas was obtained by him, he says nothing further remained but to determine its nature, and 'I discovered with *much surprise* that it was not capable of combination with water by agitation,' &c. Now why the expression of surprise in describing phenomena which had been already shown? And why the omission of all mention of Dr. Priestley's name? I confess that this seems to me capable of no other explanation