proportion of the isotopes of lithium varied with the physical conditions, which are inconsistent with those obtained by Aston [4] and Bainbridge.[5]

In our optical method a definite change in the relative intensity of the isotope lines with the physical conditions has also been observed. At the initial stage of heating of the absorption tube, containing metallic lithium in a hydrogen atmosphere, lithium begins to combine with hydrogen, forming lithium hydride. In the absorption spectrum in such a condition numbers of fainter lines (those of Li^6H) are greatly enhanced, the ratio of the two isotope lines (Li^7H : Li^6H) being about 2 : 1. However, this value becomes larger as the vapour of lithium hydride tends to reach a stationary state up to about 8 : 1. This is in good agreement with the result of Dempster obtained by a different method and our latter value with 7·2 of Wijk and Koeveringe [6] from intensity measurements of isotope lines in the band spectrum of lithium.

GISABURO NAKAMURA.

Physical Laboratory,
Hokkaido Imperial University,
Sapporo, Sept. 5.

[1] *Zeit. für Phy.*, **59**, p. 218; 1930.
[2] *Phil. Mag.*, **43**, p. 857; 1920.
[3] *Phys. Rev.*, **18**, p. 420; 1921.
[4] *Phil. Mag.*, **43**, p. 420; 1920.
[5] *Phys. Rev.*, **37**, p. 1706; 1931.
[6] *Proc. Roy. Soc.*, A, **132**, p. 98; 1931.

Symbiotic Algæ of Corals.

IN a recent contribution [1] Dr. C. M. Yonge, summarising his physiological work on corals published by the Trustees of the British Museum, took the opportunity to express his disagreement with Prof. Gardiner on the question of the significance of the symbiosis between corals and zooxanthellæ.

I am neither physiologist nor hydrologist, but it appears to me that Dr. Yonge may be basing on a false premise his argument that reef corals can get on quite well without the oxygen produced by the photosynthetic action of their zooxanthellæ. Dr. Jan Verwey, director of Den Helder Zoological Station, who has just returned to Europe after several years ecological study of corals in the East Indies, tells me that even when there is a good current flowing over a reef yet there may be a basal layer of very slowly moving water, so that a populous reef may easily suffer from a shortage of oxygen. It is, therefore, not by any means safe to assume that the movement of water round a reef always ensures a constant supply of oxygen.

Reviewing the ecological work of Vaughan, Mayer, and other Americans, the work of our own Great Barrier Reef Expedition, and that of a group of Dutch workers in the East Indies, it will be realised how rapidly our understanding of corals and coral reefs is being advanced.

A. K. TOTTON.

Natural History Museum,
South Kensington, Sept. 3.

[1] NATURE, **128**, 309, Aug. 22, p. 309.

I HAVE read Capt. A. K. Totton's letter and also Dr. J. Verwey's recently published paper [1] with the greatest interest. There can be little doubt that where reef corals grow in still water the oxygen produced by their zooxanthellæ may be of vital importance to them. Though here it must always be borne in mind that were not the zooxanthellæ present their place would be taken by a much more abundant phytoplankton continually producing oxygen in the water round about. But still water is seldom found (except during short periods of summer calms, and even then currents and upwelling continue) on the outer slopes of fringing and barrier reefs or of atolls, which are *the* essential areas of coral growth. In the case of the last two, indeed, which rise abruptly from deep water, there is frequently an upwelling of oxygenated water from deep waters as well as the continual agitation by the surf near the surface.

In enclosed areas, such as the Bay of Batavia, where Dr. Verwey has carried out his important work, or within atoll lagoons, the ability of corals to form reefs may well be controlled by the production of oxygen by their zooxanthellæ. But on the other hand, the vital factor even here may still be the removal of excretory products from the corals by the zooxanthellæ. It is very difficult to obtain adequate experimental proof one way or the other. For a long time during my work on the Barrier I believed that the production of oxygen by the zooxanthellæ was of vital significance to the corals, but, unable to obtain any adequate confirmation, I finally abandoned this belief. I hope to discuss the whole matter in detail in forthcoming papers in the Scientific Reports of the Great Barrier Reef Expedition.

Progress is certainly being made in the elucidation of the many biological problems connected with coral reefs, but each expedition raises almost as many problems as it, wholly or in part, solves. We are now, I think, nearing the solution of one most important problem, namely, the factors controlling the depth to which reef-building corals can live. For that reason I trust that an opportunity will soon present itself of making further progress towards the solving of this great oceanographical riddle, the key to which will probably be found in the nature of the relationship between reef-building corals and the zooxanthellæ.

C. M. YONGE.

Marine Biological Laboratory,
Plymouth, Oct. 10.

[1] "The Depth of Coral Reefs in Relation to their Oxygen Consumption and the Penetration of Light in the Water", *Treubia*, **13**, pp. 169-198.

The Comma Butterfly in England.

THE Comma butterfly *Polygonia c-album* died out in the east of England early in last century but survived in the west, and of recent years has been extending its range to the east again, reaching Twickenham in 1928.

A Comma visited *Sedum spectabile* in my Chiswick garden on Sept. 21, 22, 23, and 24, 1929.[1] In October 1929 it was recorded at Surbiton in the *Times*. This year on Oct. 5, 6, and 9 this butterfly has again visited *Sedum spectabile* in my garden, a fact which suggests that the species is establishing itself in the district. As a rule every September, tortoiseshells and red admirals come freely to *Sedum spectabile* here, but in the cold, wet month we have just had, the only visitor has been this rare butterfly.

F. SHERWILL DAWE.

Ashburton, 67 High Road,
Chiswick, W.4,
Oct. 9.

[1] NATURE, **124**, 653, Oct. 26, 1929.

SINCE the publication of Dr. Dawe's letter in 1929, a good deal of evidence bearing on the spread of *Polygonia c-album* in south-eastern England has accumulated. At that time, only one definite record for Kent (in 1916) could be found; it has now been seen in East Kent (1929) and at Sandhurst (1930). In Sussex it appears to have established itself fairly securely along the South Downs about Chichester and Arundel, and also farther east at Lewes and East-