

of the crystallographer, to whom the birth and growth of crystals are a study in themselves. Whether we watch with the microscope a tiny crystal growing from a drop of solution, or contemplate with the imagination the stages by which the fiery lavas of past geological periods sank to rest and crystallised, we view the same process; it is the transformation of liquid into crystal. Not necessarily into a solid, for recent research shows that there is no dividing-line between liquid and solid; a plastic solid body may flow; a solid glass is only a supercooled liquid; witness, for example, the experiments of Adams on rocks and of Tamman on supercooled liquids. The real primary distinction is between crystalline and non-crystalline material, and there is even good reason to believe that some crystals are liquid without ceasing to be crystals.

The properties of most rocks, of metals, alloys, ice, and many other substances are due to the fact that they consist of crystals, and the importance of the study of the latter is now, I trust, being brought home alike to chemists, physicists, geologists, and engineers in connection with problems relating to the strength, the movements, the origin, and changes of what are usually called solids.

And so I close, as befits a student and teacher of crystallography, with the hope that renewed attention may be paid to this subject, and that it may attract the interest of many a keen intellect in South Africa. The higher scientific studies are now establishing themselves as an integral part of the educational and intellectual life of the country. This is in no small measure due to the South African Association; and we may hope that the visit of the British Association will be of some help to her younger sister in the task of diffusing a taste and an interest for the pure truths of science and the studies that they both hold dear.

CORRESPONDENCE.

THE TRIMINGHAM BLUFFS.

SIR,—As no stress was laid on the presence of *Belemnitella mucronata* in the Chalk at Trimmingham, and we do not consider the erratic of that rock in the Cromer district to have made more than short journeys, we cannot agree with Mr. B. B. Woodward about the importance of the literature of the subject since 1882. One of us was acquainted with the general results of Mr. Brydone's work, but thought minute zonal information had no direct bearing on our objections to Mr. Clement Reid's hypothesis. That of a sea-stack, though less open to stricture, involves some serious difficulties which Mr. B. B. Woodward has apparently overlooked. Surely the majority of these masses at Trimmingham cannot be 'stacks.' On the right of the reproduced photograph (Pl. XXII) boulder-clay can be seen underlying the chalk mass (E) at (F), and another one (C) at (D). Again, if (C) merely rests against (A), to form the roof to the tunnel (B) filled with boulder-clay, it must be an erratic, for sea-stacks are not generally mushroom-shaped. The small chalk mass further east, seen in 1900 (p. 399) but now washed away, must, we think, have been a boulder, while if the

original eastern mass, which has met a similar fate, was a stack, the fact (more than once recorded in our notes) that the flint bands in it were fairly horizontal and those in the other sharply curved, was, to say the least of it, singular, for it would require the axis of flexure to have taken a very abnormal course. But if (A) and (C) form parts of one stack the position of the tunnel (B) is hardly less singular, for, instead of looking in the teeth of the waves, it takes a sheltered course more nearly parallel with the coastline. It is therefore highly improbable that any other mass than (A) can be a stack, and if so, it is curiously environed by great boulders. But if it be, what becomes of Mr. Reid's hypothesis? Did the advancing ice-sheet first 'ruck' up the chalk, then retreat to allow the sea to carve out a stack (and make a tunnel if (B) and (C) form one mass), and return to wrap it up in boulder-clay? Or was a pre-Glacial stack mercifully spared by the ice-sheet? In fact, the sea-stack hypothesis involves so many difficulties that Mr. Woodward must pardon us for suggesting the possibility of his having been misled in regard to the chalk in the headland being one mass with that in the platform. In a material like chalk, as we found at the arch, it is difficult to determine continuity or discontinuity, and equally so to trace bands of interrupted flints. But be this as it may, Mr. Woodward has discarded Mr. Clement Reid's hypothesis, and in so doing indirectly justifies our remark that it was out of place in a Survey memoir. To this we adhere, though it may cause "some surprise" to "students of East Anglian geology" (are they a zonal variety?). This is our reason: A Survey memoir is an official publication, which is inevitably invested with authority. It is also published, as the work is done, at the cost of the nation. We therefore hold that it should be a record of facts, not of hypotheses of a more or less tentative or dubious character: these find a proper home in the ordinary scientific periodicals. Thus no one could object to the appearance of Mr. Reid's hypothesis in this Magazine, but in the Cromer Memoir a mention of it with a reference would have sufficed.

T. G. BONNEY.

E. HILL.

THE TRIMINGHAM CHALK.

SIR,—May I suggest a small innovation in your usual practice, which would be very grateful to your subscribers, namely, the reprinting of Mr. Brydone's remarkable paper in the GEOLOGICAL MAGAZINE. This paper, to which Mr. B. B. Woodward has called timely notice, has virtually only been privately published, and the fact of its not being quoted by Professor Bonney and Mr. Hill may perhaps be thus explained, although it has been out for *five years*, and is specially quoted and utilized in so accessible a monograph as the partly Survey Memoir on the Cretaceous Rocks of Great Britain, published a year ago (*op. cit.*, pp. 260–264), which also seems to have escaped the notice of the two authors just cited.

[I have procured a copy of Mr. R. M. Brydone's paper, dated August, 1900. It is a pamphlet of 16 pages, and was published separately by Dulau & Co. (price 1s.)]