

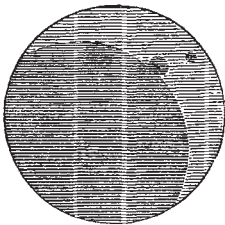
extremely busy, and the ultimate success of our operations must in a great measure be attributed to the unremitting energy of Mr. Lockyer and Prof. Roscoe.

Up till to-day the weather has been superb, day after day just like the warm days we often have in England towards the end of June. The thermometer in the shade has reached from 75° to 80° F., while the barometer has been steady, but with just sufficient tendency downward, to fill with gloomy apprehension the less sanguine of our party. During this afternoon things do not look well, heavy clouds have been sailing over head, and have quite shrouded the upper five thousand feet of Etna; but we have yet hope, and all we can do is to wait patiently for about twenty hours, hoping then to get at least a bright gleam for the space of a minute and a half. If the sky so far favour us doubtless to-morrow will be an epoch in the history of astronomy.

L. CUMMING

Catania, Sicily, Dec. 21, 1870

The Eclipse



A REMARKABLE phase in the moon's passage across the sun was the perfect apparent contact of the limb of the moon with a sun-spot, of which the annexed figure is a fair representation. The noticeable thing was that the body of the moon itself and the sun spots were of so precisely the same tint that no trace of a division was perceptible, one appearing to be merged in the other as long as the contact lasted.

Exeter, December 22, 1870

W. F.

Eozoön Canadense

THE letter of Mr. T. Mellard Reade on the subject of *Eozoön Canadense*, contained in your number for December 22, exhibits so complete a misapprehension of the state of our knowledge of that fossil, that I feel it necessary to break the silence which I have for some time imposed upon myself as regards this subject, in order that your readers may not be misled by the positiveness of his assertions.

1. Mr. Reade speaks of Eozoön, with the exception of the Tudor specimen, as having been obtained *only from metamorphosed rocks*. In reply to this, I have to state that the Eozoöal structure is *most* characteristically displayed in those portions of the Serpentine Limestone of the Laurentian formation which have undergone the *least* metamorphic change. In fact, the Calcareous lamellæ of the best specimens of Eozoön in my possession show less departure from the shelly texture with which I have become familiarised by the special study of the microscopic appearances of Shell, &c., for more than thirty years, than do the great majority of undoubted shells, corals, &c., contained in the least altered rocks of any geological period.

2. Mr. Reade assumes that the presence of the Serpentine lamellæ, which alternate with the Calcareous lamellæ, is itself an indication of metamorphic action. This position can only be sustained by those who are ignorant of the processes which can be shown to be at present going on upon the sea-bottom, and of which we have evidence in various geological periods; whereby the sarcodic substance of animals of various types of organisation, but especially of *Foraminifera*, undergoes replacement by siliceous compounds precipitated from sea-water during its decomposition. It was long since shown by Prof. Ehrenberg, that green sands of various ages, from the Silurian to the Cretaceous, are essentially formed of the *internal casts* of *Foraminifera*. The late Prof. Bailey (U.S.) first proved that the production of such internal casts is taking place at the present time. I have long had in my possession a set of beautiful internal casts of this kind, procured from the late Mr. J. Beete Jukes's dredgings on the coast of Australia. And quite recently I have obtained from Captain Spratt's dredgings in the *Ægean* a most remarkable series of such casts, which includes representations in green and ochreous Silicates, not merely of the sarcodic-bodies of *Foraminifera*, but also of the sarcodic network that occupies the interspaces of the calcareous reticulation which I demonstrated twenty-three years ago (Brit. Assoc. Report for 1847) to be the

basis of the skeleton throughout the class of *Echinodermata*. And Dr. Duncan has shown that a like process is taking place at the present time in the case of *Corals*; their animal substance being replaced by Silicates, whilst their Calcareous skeleton remains unchanged. No *mechanical* agency can account for this replacement. It is not effected by the percolation of Silicates in solution, under the "*hydrothermal*" action which Mr. Reade (following the lead of Messrs. King and Rowney) invokes as having been concerned in the production of the Canadian Eozoön. And I am justified by the opinion of several of our ablest Chemists and Mineralogists in the assertion that no agency save a progressive *chemical substitution* can account for the production of these wonderful models; the Silicates being precipitated from sea-water by the decomposition of the sarcodic substance which they replace and represent. Whether or not this doctrine be accepted, it may be confidently affirmed that whatever be the agency concerned in *their* production, the filling-up of the cavities of the Calcareous skeleton of Eozoön may be fairly accounted for in the same manner.

3. The most characteristic features of the best-preserved specimens of the Canadian Eozoön can thus be completely paralleled by those of analogous formations at present going on. Let us suppose that the North Atlantic sea-bed, instead of being covered by minute individualised *Globigerina*, were occupied by a shell-producing Rhizopod having the indefinite extension of *Bathybius*, and that its sarcodic substance came to be replaced (as in the instances just cited) by Silicates precipitated from sea-water; such a composite formation, elevated so as to become a terrestrial rock, *without any metamorphism whatever*, would be the precise parallel of the *Eozoön Canadense*. And just as, at the present time, the replacing minerals are not always the same, though always compounds of Silica, so the substituted material in Eozoön often consists of other minerals than Serpentine, always, however, being Silicates. In fact it was the *uniformity* of Morphological character, with *variety* of Mineral composition, that first led Sir William Logan—a geologist second to none in experience and judgment—to the suspicion of its organic origin.

4. Mr. Reade represents me as having made "the important admission" that "the several features in the structure of Eozoön (chamber-casts, canal-system, and proper walls) could be separately paralleled elsewhere," meaning, I presume, in undoubtedly Mineral structures. I have nowhere, that I can recollect, made any such admission: on the contrary, I have repeatedly argued that whilst the *combination* of structural characters in Eozoön affords the most unmistakable evidence to those whose previously acquired knowledge enables them to appreciate their value, there are individual features which are inconsistent with any conceivable hypothesis of its purely Mineral character. Of these I may here state two, which I have always found to be most convincing to such as are familiar with the microscopic appearances of Minerals: *First*, the fact that the "canal-system" which traverses the Calcareous lamellæ passes *across* their cleavage-planes, instead of *between* them; and that this canal-system has precisely the same distribution, whatever may be the mineral which occupies its tubes, whilst its finest ramifications are frequently filled with calcite, as in the least-altered fossil *Foraminifera*. The idea that such arborescent expansions can have been produced by any kind of *infiltration* of one mineral into another, is thus, in the judgment of some of the most eminent Mineralogists of the day, *altogether untenable*; whilst the *precise parallelism* pointed out by Dr. Dawson, between the canal-system of Eozoön and that which I had shown to exist in the recent *Calcarina*, is no less satisfactory to Naturalists conversant with *Foraminiferal* structure. *Second*, the fact that the "Nummuline layer" or "proper wall" of the chambers consists of a Calcareous lamella traversed by Siliceous aciculi, which sometimes lie straight and parallel, are sometimes curved, and sometimes penicillate; the precise equivalent to this being shown in the chamber-walls of recent *Foraminifera*, when the pseudopodia which occupied their tubuli during life have been replaced by Silicates. I assert again, on the authority of Mineralogists of the highest eminence, that such an arrangement cannot be shown in any undoubted mineral, and that it cannot be attributed to any physical agency. To liken this "Nummuline layer" to Chrysolite or any similar modification of Serpentine, shows a misapprehension of its essentially composite structure.

5. I cannot admit that the question of the Organic nature of the Canadian Eozoön (if question it be) is in the least degree affected by the occurrence of Metamorphic rocks presenting more or less morphological resemblance to it, in combination with undoubtedly Mineral characters. We should never think of deci-