

whole of my collection can be unpacked and settled in its new quarters, so I have thought it better not to delay longer the admission of the one point where I find that I have erred.

P.S.—The above remarks were written before the October Number of the *MAGAZINE*, containing Dr. Roberts' second paper, had reached me. I leave them as they were written, though he appears now to have visited the Port Dinorwic district, and distinctly speaks of felsite pebbles in Anglesea, because his examination of the former does not seem to have been careful enough to show him that the grits become conglomeratic near Tan-y-maes, and I do not admit that the question can be settled by the latter. I have not myself been struck with the remarkable resemblance of the conglomerate of Garth Ferry to that of Twt Hill, and think that by the method of reasoning here adopted I could prove even the Bangor series of Prof. Hughes to be only Cambrian conglomerate.—T. G. B.

V.—CONTRIBUTIONS TO THE PALÆOBOTANY OF SWEDEN.¹

By WM. CARRUTHERS, F.R.S., F.L.S., F.G.S.

MR. A. G. NATHORST, whose recent contributions to the Palæobotany of Sweden have been very valuable, has been turning his attention to the impressions found on the surface of schists, especially in Palæozoic rocks, which have been too readily accepted as impressions of plants. They find a place among the Algæ of Schimper's "Traité de Paléontologie Végétale," and they are employed by Saporta and Marion in their recent work, "L'Évolution du Règne Végétal," and are treated as Algæ, and employed as data in their account of the evolution of the vegetable kingdom. Mr. Nathorst, so long ago as 1873, called in question the plant origin of many of these markings, and he has recently published in the Transactions of the Royal Swedish Academy (vol. xviii. No. 7, Stockholm, 1881) an exhaustive treatise on the subject, with eleven phototypic plates of impressions which he obtained by the motions of different animals or the trails of plants on soft materials. He first experimented with gypsum, getting the animals to move over the surface while it was soft, and securing the permanence of the tracks by the hardening of the gypsum. This method was satisfactory with the smaller crustacea, but annelids and molluscs moved so slowly that the gypsum hardened before they crossed it. And, besides, it was not possible to experiment in this way with some marine animals, for the fresh water with which the gypsum was mixed at once killed them. The earlier plates are devoted to the impressions produced on the soft gypsum. The results are remarkably like the *Arthropycus* and *Crossochorda* of the Silurians. These impressions have been produced by the following Crustacea: *Corophium longicorne*, Fabr., *Crangon vulgaris*, Fabr., *Jæra albifrons*, Leuck., *Gammarus locusta*, Linn., and *Idothea baltica*, Pall. The markings made by the *Idothea* are singularly like the impressions of a Lycopodium, or of some branching sea-weed, like *Caulerpites*, Sch.

¹ Om Spår af Några evertebrerade djur MM. Och Deras Paleontologiska betydelse, af A. G. Nathorst, med 11 Tafior, 4to. pp. 60.

Kongl. Svenska Vet. Akad. Handl. Band. 18, No. 7. Stockholm: 1881.

Nicholson and Etheridge had given a similar explanation of *Crossopodia*, and other *Nereites* markings in their valuable contribution to Silurian Palæontology (see their Monograph of the Silurian Fossils of the Girvan district, pp. 304-318).

Mr. Nathorst further experimented with fine mud obtained from a depth of 12 to 15 ft., and which he placed, with all the animals contained in it, in vessels of different depths. It was remarkable how speedily after the vessels were at rest a great multitude of very different tracks were produced. It became obvious that the seabottom, where it consists of fine sediment inhabited by animals, must be completely covered by trails of different kinds. The most curious specimens procured were the trails of *Goniada*, *Glycera*, and some other annelids which were found to be *constantly branched* as in the impressions referred to the genus *Chondrites*. The impressions, which are reproduced with minute fidelity and beauty in the phototypes, were fixed by pouring liquid gypsum over the wet mud, a method which Mr. Nathorst found to succeed in preserving the most delicate markings. The trails of the annelid *Goniada maculata*, Oersted, are very familiar as Palæozoic "Algæ." In one of the specimens of this creature's work (pl. ix. fig. 1), we find several "plants" springing from one place, that in the centre is more vigorous than the others, and gives off in an *alternate manner* from its main axis a number of branches which are again branched. This is so singularly faithful an outline of some fossil algæ, that nothing short of the testimony of so careful an observer as Mr. Nathorst would convince one that it could have been produced by an animal. The radiating tentacles of a *Terebella* produce a good imitation of a plant. The impressions of an *Amphiura*, which had been lying on the mud with its arms extended, but had gently moved the ends to and fro, gives a branching appearance, with a flabellate outline to the "frond." The trails of molluscs like *Montacuta*, and the larvæ of some dipterous insects, obtained in a garden after rain, are figured, showing long simple markings twisting and turning on themselves, and giving very faithful representations of the impressions referred to *Palæochorda*. The markings made by earth worms supply also very good materials for interpreting some impressions generally treated as species of fossil algæ. Mr. Nathorst's figure on p. 19 may be compared with the figures of *Physophycus marginatus*, Sch., on p. 87 of Saporta and Marion's recent work.

Mr. Nathorst compares in detail, and with great care, the results of his experiments with the list of *Algæ* contained in Schimper-Zittel's "Handbuch der Palæontologie," and finds that all the impressions brought together under the title "*Algæ incertæ sedis*" can be produced by animals or by the mechanical action of plants operated upon by running water. These Palæozoic algæ are mere impressions on the surface of ancient mud, and never exhibit any remains of organic matter. It is very satisfactory to obtain such clear evidence of their true nature, and to get rid of the false genera and species which have unhappily burdened our handbooks, and of the speculations which have been based on these misunderstood markings.

With these must also go the impressions from the Lower Silurians of Sweden which constitute the genus *Eophyton*. These were always known to be only surface markings, but so remarkably did they imitate stems and leaves of plants that it was very difficult to gainsay those who unhesitatingly placed them among vegetables. And if vegetables, it seemed certain that they belonged to Phanerogamous plants, and not to any of the lower groups of Cryptogamous plants whose remains are the earliest vegetable fossils met with. Mr. Nathorst has produced typical specimens of *Eophyton* from the trails of plants over soft mud. So that while *Eophyton* testifies to the existence of life on the shores when the markings were made, these markings supply no evidence as to the nature or form of the plants by which they were produced.

It may be worth while to add a sentence to this notice in order to record that the doubt already thrown on Saporita's Lower Silurian fern *Eopteris Morieri* was confirmed by the examination of a specimen exhibited at a recent meeting of the Geological Society. And that the mineral nature of the markings was completely established, and the impossibility of its being a plant was pointed out by Dr. Sterry Hunt when he showed that it lay along the lines of the slaty cleavage, and not on a surface of deposition.

NOTICES OF MEMOIRS.

- I.—OM AFTRYCK AF MEDUSOR I SVERIGES KAMBRISKA LAGER. AF A. G. NATHORST, Kongl. Svenska Vetenskaps-Akademiens Handlingar. Bandet 19, No. 1. Med 6 Tafior. Stockholm, 1881. On Impressions of Medusæ in the Cambrian Rocks of Sweden. By A. G. NATHORST.

IN this Number of the MAGAZINE a notice is given by Wm. Carruthers, Esq., F.R.S., of a paper by Herr Nathorst, in which he brings forward reasons to show that the impressions on beds of sandstone of Cambrian age, hitherto regarded as plants, and known under the generic name of *Eophyton*, were more probably markings produced by the trails of Medusæ. In the present paper the author endeavours to prove that the same beds contain impressions and casts of these organisms. The possibility of jelly-fishes leaving proofs of their existence in the rocks is well known from the indubitable impressions left by these animals in the Solenhofen slates. The *Eophyton* sandstones are, however, much less fitted to receive and retain the markings of delicate organisms than the lithographic beds of Solenhofen, and it is not, therefore, to be wondered at that the impressions they contain, being ruder and more indefinite in their character, should have been variously interpreted. This accounts for the circumstance that the forms now referred by the author to Medusæ have been previously described by Torell and Linnarsson under the generic names of *Spatangopsis*, *Agelacrinus*?, *Protolyellia*, and *Astylospongia*,