

general matrix of the rock surrounds the balls or nodules of orthoclase without any intermediary concentric oligoclase layer.

Microscopically it differs also from the other variety in being destitute of microcline. It occasionally shows micro-pegmatitic structure; and its quartz is peculiar, being very idiomorphically developed and containing long needles (microliths) of a dark-coloured mineral which the American geologist Hawes declares to be rutile.

In its stratigraphical relationships the western rapakivi is very interesting, a great deal of evidence having been collected tending to show that it has both exercised an enormous pressure on the rocks through which it has been forced, and has itself in places been modified by this pressure, which may perhaps justify the assumption that it was in a very pasty condition when irrupted. The southern rapakivi on the contrary does not appear to have modified the surrounding rocks at all.

Great masses of granite, syenite, and elæolite-syenite occur throughout the country; but as they do not on the whole differ from similar rocks in other districts, I have not devoted any space to a description of them.

The various questions relating to the origin, characteristics and occurrence of pegmatites, I propose to reserve for future consideration.

NOTICES OF MEMOIRS.

THREE PAPERS ON GRAPTOLITES.

1. UEBER DAS ALTER DES SOGEN. GRAPTOLITHEN-GESTEINS MIT BESONDERER BERÜCHSICHTIGUNG DER IN DEMSELBEN ENTHALTENEN GRAPTOLITHEN. VON HERRN OTTO JAEKEL, in Berlin. Zeitschr. d. deutschen geolog. Gesellschaft, Jahrg. 1889, pp. 653–716, Taf. xxviii, xxix.
2. GOTLANDS GRAPTOLITER. Af GERHARD HOLM. *Bihang till K. Svenska Vet.-Akad. Handlingar*, Bd. 16, Afd. iv. No. 7 (1890), pp. 1–34, Taf. 1, 2.
3. UNDERSÖKNINGAR ÖFVER SILJANSOMRÅDETS GRAPTOLITER. Af Sv. LEONH. TÖRNQUIST. *Lunds Univ. Årsskrift*, Tom. xxvi. pp. 1–33, Taf. i. ii.
1. ON THE AGE OF THE SO-CALLED GRAPTOLITE STONE, WITH SPECIAL REFERENCE TO THE GRAPTOLITES CONTAINED THEREIN. By OTTO JAEKEL.
2. THE GRAPTOLITES OF THE ISLAND OF GOTLAND. By GERHARD HOLM.
3. AN EXAMINATION OF THE GRAPTOLITES OF THE DISTRICT OF SILJAN, DALARNE, SWEDEN. By Sv. LEONH. TÖRNQUIST.

SCATTERED through the Drift of Northern Germany there are numerous boulders of calcareous rock containing, with various other fossils, several species of Graptolites, and for this reason they were styled “Graptolithen-gestein” by Ferd. Roemer. The parent-rock of these boulders, situated somewhere in the Silurian basin of

the Baltic, has not yet been discovered, and different opinions have been expressed as to the particular divisions of the Silurian to which the boulders belong. By the majority of German geologists they have been referred to the highest series of the Silurian; the Swedish geologists on the other hand place them about the middle of the Upper Silurian series. With the view of elucidating the question, Dr. Jaekel has examined the Silurian outcrops in the West of England, and he finds that there is a very close correspondence both in the petrological characters and the fossils of these boulders with the beds of Wenlock Shale age exposed at Burrington, near Ludlow, and therefore he maintains that they really are of the age of the Wenlock Shale.

In the present paper the characters and the geological distribution of the fossils in the boulders are treated of, but the author more particularly refers to the Graptolites, and brings forward some new structural features which in his opinion will considerably modify their present classification. Thus in the genus *Monograptus*, two groups are proposed, based chiefly on the different position of the thecal aperture and its appendages. In the first of these, *Pristiograptus*, the aperture is free, and occupies the entire upper end of the theca, and the only appendages are spines on the lower margin of the aperture, and these are not always developed. In the second group, *Pomatograptus*, the outer portion of the theca is contracted, the aperture is small and situated beneath an extended roof-like process which forms the upper end of the theca. Hitherto the thecal aperture in these Graptolites has been supposed to be at the extreme end of this arched process, but the well-preserved examples figured by Dr. Jaekel show that this view is erroneous.

The author further maintains that Graptolites were not free-swimming organisms, but probably lived at the bottom of deep seas lightly anchored in the mud. He also considers that the simple forms of *Monograptus* are not complete, but only branches of colonial stocks; but, as pointed out by Dr. Holm, he seems to have overlooked the fact of the presence of the sicula, which is never wanting at the proximal end of the organism, and thus conclusively shows the primary commencement of the growth of the polypary. A description of the structure of *Retiolites* is likewise given, but in this no account is taken of the earlier works of Törnquist and Tullberg.

In the second paper above mentioned, Dr. G. Holm has revised the list of Graptolites occurring in the Silurian strata of the Isle of Gotland, and enumerates the following nine species and varieties; *Dictyonema cervicorne*, n. sp., *D. abnorme*, n. sp., *Monograptus priodon*, Bronn, *D. priodon*, var. *Flemingii*, Salt., *M. subconicus*, Törnq., *M. dubius*, Suess, *M. sp.*, *Retiolites Geinitzianus*, Barr., and *R. nassa*, n.sp. A list is given of the names and distribution of the known species of *Dictyonema*, and a very careful description of a new species, *D. cervicorne*, based on specimens obtained free from matrix. In these the upper portion of the theca is extended into a long, spined process bifurcated at the extremity; and connected laterally with each theca there is a cup-like or nest-shaped structure, possibly a

gonangium. Dr. Holm further describes and figures some remarkably well-preserved examples of *Retiolites* and *Stomatograptus*, in which the structural details are clearly shown.

In the third paper, Professor Törnquist describes 22 species of Graptolites occurring in the Ordovician and Silurian strata of the district of Siljan; of these the following are regarded as new, *Clonograptus robustus*, *Tetragraptus curvatus*, *Didymograptus gracilis*, *D. decens*, *Climacograptus internexus*, and *Diplograptus bellulus*. Many of the species in the area referred to are likewise common to the Coniston Flags and to the Quebec Group of Canada.

R E V I E W S.

L'ARCHÉEN ET LE CAMBRIEN DANS LE NORD DU MASSIF BRETON ET LEURS ÉQUIVALENTS DANS LE PAYS DE GALLES. PAR A. BIGOT, Docteur-ès-Sciences. (Cherbourg, 1890.)

DOCTOR BIGOT is a young French geologist who is rapidly winning his spurs. Having done excellent work amongst the older rocks of Northern France, he came over to Great Britain, and compared the systems with which he was familiar with some of the basal rock-groups of Wales and Shropshire. The results of this comparison are given in the work before us, and will be found to be in substantial agreement with the views maintained by those who in this country have paid the fullest attention to the Archæan and Cambrian rocks.

In the first part of his work Dr. Bigot describes the phyllads and purple conglomerates in the district of Saint-Lô and in the west of Calvados. From the typical area, he passes to the northern extension of these formations, as studied in the district round Cherbourg. He then takes up the same rock-groups south of Saint-Lô, and describes their occurrence in the south of Calvados, at Granville, and in the island of Jersey, which lies about 30 miles to the north-west of Granville. In Chapter IV. the author discusses the relation between the Phyllads and the older Palæozoic groups. Chapter V. gives an account of the eruptive rocks of Normandy and the Channel Isles; and Chapter VI. concludes the first part with a description of the general stratigraphy of the Breton *massif*. In the succeeding chapters the author discusses the correlations of the older rocks of north-western France with their equivalents in Pembrokeshire, North Wales, and Shropshire; and winds up with an excellent summary of his conclusions. Then follows a valuable bibliographic index, the authors being classed under the respective heads of "The Breton *massif*," and "Wales" (including Shropshire).

The schistose and slaty rocks named after the town of Saint-Lô, and usually referred to by French geologists as "schistes" or "phyllades," have been described by a long series of writers. Dufrenoy in 1838 identified them with the Cambrian of Great Britain, a very natural opinion at a time when the Longmynd series was accepted as typical Cambrian, and when the existence of slaty rocks below the Cambrian was not recognized in Europe.