IV.—Zur Paläozoischen Flora der Arktischen Zone, enthaltend die auf Spitzbergen, auf der Bären-Insel, und auf Novaja Zemlja von den Schwedischen Expeditionen entdeckten Paläozoischen Pflanzen. Von A. G. Nathorst. Mit 16 Tafeln. Kongl. Svenska Vetenskaps-Akademiens Handlingar. Bandet 26, No. 4, pp. 80. (Stockholm, 1894.)

On the Palæozoic Flora of the Arctic Zone, comprising the Palæozoic Plants Discovered by the Swedish Expeditions on Spitzbergen, Bear Island, and Novaya Zemlya. By Dr. A. G. Nathorst.

THE occurrence in Spitzbergen of plant remains of Palæozoic age was first made known by Roberts in 1838; several subsequent Swedish geological expeditions also obtained them, both from Spitzbergen and from Bear Island, and the collections were described by the late Professor Heer. The last Swedish expedition, in 1882, under the leadership of Nathorst and de Geer, discovered Carboniferous plants in several new localities in Spitzbergen, and also for the first time they found plant remains in the Devonian rocks of Liefde Bay. They further ascertained that the true position of the Carboniferous plant-bearing strata of Roberts' valley, which had been described as above the marine Permo-Carboniferous formation, was beneath this series, its apparent position being due to an inversion of the beds. The present Memoir contains descriptions and figures not only of the newly-discovered plants, but of those previously collected and worked out by Heer, the originals of which, now preserved in the Stockholm Museum, have been revised by Dr. Nathorst, with the result that many are shown to belong to quite other groups than those in which Heer had placed them.

Taking first the plants from the Devonian or Old Red Sandstone rocks of the Liefde Bay series of Spitzbergen, it appears that they occur on two horizons—a lower, in which only fragmentary remains of a form resembling the *Psilophyton* of Dawson have been found; and a higher containing remains of *Lepidodendron*, *Bergeria*, and *Bothrodendron*, and also the leaves of a probable Gymnosperm, named *Psygmophyllum Williamsoni*. The plants are too fragmentary to be compared with the Devonian of other regions, but they show a relationship to the succeeding Lower Carboniferous flora.

The stratigraphical relations of the beds yielding the Carboniferous plants on Spitzbergen have not yet been satisfactorily determined. It is certain that they are below the marine Permo-Carboniferous series, but hitherto the existence of the Carboniferous Limestone has not definitely been made out, though it is possible that it may be represented by the *Cyathophyllum*-limestone. The new forms from the Carboniferous include species of *Sphenopteris*, *Cardiopteris*, and *Lepidodendron*. The forms described by Heer as *Cordaites* and as leaves of *Rhynchogonium* are considered by Nathorst to be unusually large stems of fern fronds. A comparison of these Carboniferous plants with those from other areas shows a very close resemblance with the flora of the Culm and that of the Bergkalk on the continent,

and equally so with that of the Calciferous Sandstone in Scotland, so that it may justly be considered a Culm flora. It has no special relation with the Old Red Sandstone flora, and therefore Heer's name of the "Ursa-Stufe" is not applicable to it. One of the remarkable features of this flora is the large size of the Ferns, *Lepidodendra* and *Stigmaria*, which show that the climate of the Lower Carboniferous epoch in Lat. 78½° N. must have been equally as favourable to plant life as that of the European continent at the same period.

Coming now to the Palæozoic flora of Bear Island, Dr. Nathorst modifies very materially Heer's determinations of the plants collected by Nordenskiöld and Malmgren. Thus, for instance, he doubts the occurrence of genuine *Calamites*, many of the specimens referred to this genus really belonging to *Knorria*, and one is provisionally placed as a new genus and species, *Pseudobornia ursina*. Several species of *Bothrodendron* are also present; one of these is identical with *B.* (*Cyclostigma*) *Kiltorkense*, Haughton, from the Old Red of Ireland. Many specimens placed under *Knorria* prove to be fragments of *Bothrodendron*. There is, further, no ground for supposing that *Lepidodendron Veltheimianum* occurs on Bear Island. The flora of this island is very distinct from that of the Lower Carboniferous of Spitzbergen, for with the exception of *Stigmaria ficoides* all the species are different; and it is equally as distinct from the Devonian flora of Spitzbergen. The author considers that it is intermediate between the Devonian and the Lower Carboniferous, and that the name *Ursa flora* may be retained for it.

Very little remains to be said respecting the fragmentary plants discovered by Nordenskiöld on Novaya Zemlya. The shales containing them are above the Permo-Carboniferous deposits, but the horizon they represent has not been determined. The plants were rightly referred by Heer to *Cordaites*, but on revision only two of the species described by him can be maintained. G. J. H.

V.—Étude sur les Variations du Spirifer Verneuili. Par J. Gosselet. Mémoires de la Société Géologique du Nord. Tome IV. Mém. I. pp. 61, Pls. I–VII. (Lille, 1894.)

A Study of the Variations of *Spirifer Verneuili*. By Prof. Jules Gosselet.

THE well-known and very widely-distributed Upper Devonian Brachiopod, *Spirifer Verneuili*, Murch. (=*S. disjuncta*, Sow.), is one of the commonest fossils of the Frasnien series in the North of France and Belgium. It is said to occur in the Eifélien and the *Stringocephalus* beds of the Middle Devonian, but the author considers that it makes its first appearance in the upper portion of the Givétien limestones. It reaches its greatest development in the Frasnien series and in the next higher Famennien series it is also very abundant. Here it comes into competition with *Cyrtia Murchisoniana*, and apparently gains the mastery; but in the higher beds of the series it becomes less common, and finally it disappears