

nucleus, and a wide translucent margin, marked by a slight granulation. Even this, however, may indicate nothing more than a different state of preservation.

It is proper to observe here that the wall or enclosing sac of these macrospores must have been of very dense consistency, and now appears as a highly bituminous substance, in this agreeing with that of the spores of Lycopods, and, like them, having been when recent of a highly carbonaceous and hydrogenous quality, very combustible and readily admitting of change into bituminous matter. In the paper already referred to, on spore-cases in coals, I have noticed that the relative composition of lycopodium and cellulose is as follows :

Cellulose,  $C_{24}H_{20}O_{20}$ .

Lycopodium,  $C_{42}H_{19\frac{1}{2}}NO_{5\frac{3}{10}}$ .

Thus, such spores are admirably suited for the production of highly carbonaceous or bituminous coals, etc.

Nothing is more remarkable in connection with these bodies than their uniformity of structure and form over so great areas and throughout so great thickness of rock, and the absence of any other kind of spore-case. This is more especially noteworthy in contrast with the coarse coals and bituminous shales of the Carboniferous, which usually contain a great variety of spores and sporangia, indicating the presence of many species of acrogenous plants, while the Erian shales, on the contrary, indicate the almost exclusive predominance of one form. This contrast is well seen in the Bedford shales overlying these beds, and I believe Lower Carboniferous.\* Specimens of these have been kindly communicated to me by Prof. Orton, and have been prepared by Mr. Thomas. In these we see the familiar Carboniferous spores with triradiate markings called *Triletes* by Reinsch, and which are similar to those of Lycopodiaceous plants. Still more abun-

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\* According to Newberry, lower part of Waverly group.