ALTERNATION OF GENERATIONS.—The first thing to be considered in this question is the behaviour of the cells. We may distinguish two modes of cell-division : (1) the *protistoid*, where the division of the cells is not influenced by their forming part of a complex multi-cellular body, and (2) the *colonial* or *metistoid*, where the division of every cell is dependent on its relations to the other cells of the organism at large. In Metazoa and Fucaceae a cycle of metistoid cell-division, in the formation of the organism with its buds and branches, alternates with a single short cycle of protistoid cell-divisions which produce the gametes—the oospheres (or oosphere and polar bodies) on the one hand, and the spermatozoa on the other. In archegoniate plants, and less visibly in Flowering-plants, there are two such alternating cycles of protistoid and colonial cell-multiplication : (a) starting with the zygote, we have the colonial system of the sporophyte, followed by the protistoid divisions determining the formation of the neutral spores ; (b) starting with the spores, we have the other colonial formation, that of the gametophyte, eventuating in the protistoid formation of the gametes. We have here a double alternation of twofold cycles, which thus cannot be paralleled by anything in the life-history of the lower Thallophytes, save in so far as they exhibit true tissue-formation and colonial subordination of cells. The alleged alternation in *Batrachospermum*, for instance, is really comparable with larval conditions. That we are justified in the comparison of the ill-developed sporophyte in the Muscineae with the stately ‘ plant ’ of the higher Archegoniates, is shown by the formation of such peculiar organs as true stomata in both ; and that this is not a mere case of homoplasia is shown by the fact that the conditions under which stomata are needed are found in the Marchantiaceae, and that breathing-pores which are not homologous with true stomata are here found. Again the phenomenon of nuclear reduction occurs at the same stage in both groups, to which we shall refer later.

The argument put forward that the Moss-sporophyte must be considered ‘ part of ’ the leafy plant because it is attached to it and never becomes free, takes no cognizance of the discontinuity of the oosphere at the moment of its fertilization, and the lack of continuity of the cell-network of the sporogonium with the leafy plant ; it disregards the necessary results of parasitism ; and if applied to the Vertebrata, would lead to the most curious jumbling of questions of individuality in the passage from oviparity to viviparity, with the varying intensity of the parasitism of the embryo on the mother.

Why should there be such complex alternation in the archegoniate phylum alone? The Green Flagellates show an exceptional polymorphism among the Protista; and we may fairly ascribe this to the fact that by their holophytic nutrition, manufacturing their own food-stuffs, they can grow freely and multiply in the encysted state; while holozoic feeders can only do so when in the free condition. We find extreme cases of this polymorphism in the genus *Ulothrix*, where the forms are adapted for all sorts of substrata, differing in moisture and exposure; and the reproductive modes show a tendency to similar polymorphism. It is from such a stock (but thalloid, not confervoid) that we may well suppose the Green Metaphytes to have sprung. If here, owing to greater permanence of the thallus that bears the oosphere, the zygote or product of its fertilization has the opportunity of parasitism on the parent thallus, we can easily see the possibility that its resolution into a brood of spores might be delayed with the formation of a new colonial condition, at first parasitic on the mother as in Muscineae, with partial consequent sterilization of its tissues, and then an acquisition of independence, with the sterilization carried to the extent that we find in higher Archegoniates and Flowering-plants. As to nuclear reduction, we may attempt to ascertain its significance by classifying the stages at which it occurs. In Desmids, &c., it occurs at the first divisions of the zygote. These plants have no colonial tissue-formation. In Fucaceae and Metazoa, it occurs in the first gametogenic cell-divisions; these have the single alternation of colonial and protistoid cell-multiplication; in Archegoniata, and higher plants, it occurs at the inception of the sporogenic cell-divisions, the first resumption of protistoid cell-multiplication after the doubling of the number of chromosomes by fertilization. For the present I omit the case of the Ciliata, so exceptional from all other Protista in their cytology. We may group these cases in what the mathematicians would call an 'interpolation formula,' which covers our present knowledge and which would run thus: *Nuclear reduction is the reduction of the number of chromosomes due to the union of cells in fertilization to that found in a single gamete; it occurs in the first protistoid divisions that occur after fertilization; and is the necessary secondary result of fertilization, which would otherwise lead to the indefinite increase of the number of chromosomes by constant doubling.* This view is due partially to Strasburger, partly to the writer.

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