VII. — *On some abnormal forms of Fungi, with remarks on their Morphology.* By EDWIN LANKESTER, M.D., F.L.S., B.S.E. &c.

(Read March 19, 1845).

ALTHOUGH perhaps in the remarks I shall make in this paper I may not appear to have made such use of the microscope as would warrant me in bringing them before this Society, yet I feel myself justified in doing so, by the fact that the general subject of the Morphology of cryptogamic plants can only be prosecuted by the aid of the microscope.

Shortly after the frost which occurred in December, 1844, having occasion to visit Cheshunt, I found a monstrous specimen of the *Agaricus personatus*. It was already dried up and decaying from the effects of the frost. In all its parts, however, it exhibited a normal structure, with the exception of the pileus, in the centre of which, directly over the insertion of the stipes into the hymenium, a second and smaller hymenium was developed. The gills of this smaller hymenium were uppermost, and presented towards the light, the edges were covered with the pileus, which gradually united itself with the pileus of the lower hymenium. There was no appearance of any development of the stipes (Pl. ii. fig. 5, *a*). On making a section of the whole plant, no connexion between the lower and upper hymenium was discoverable, so that the latter was evidently an independent development (Pl. ii. fig. 5, *c*). The whole plant was in too dry a state to afford a favourable opportunity of ascertaining its structure by the microscope.

On placing the upper hymenium under the microscope, it presented a cellular structure like that observed in the higher forms of fungi. The same appearance was exhibited by portions from the undermost hymenium. The tissue was too much shrivelled to observe the sporophores, and no remains of spores could be found on either hymenium. Sufficient, however, could be seen to prove the identity of the two structures, and that whatever was the character of the lower and normal hymenium, the upper one was of the same nature. The tissue between the two hymenia was found to consist of oblong cellular tissue, mixed with which were the fibres of a lower form of fungus which had been developed during the destruction of its congener.

Several instances of abnormal forms of fungi are on record, but none that I am aware of precisely similar to the one in question. In the 'Icones Fungorum' of Schæffer, are several drawings of monstrous fungi, and one of an *Agaricus* exhibiting on its pileus two smaller fungi, but these two were perfect in every respect, and the pileus and hymenium were attached to a stipes which is fixed to the pileus of the original fungus. The Rev. M. J. Berkeley, in the 'English Flora,' gives an account of an *Agaricus campestris*, in which "a portion of the pileus was occupied by what at first appeared to be a parasitic *Sistotrema*, but, on closer inspection, proved to be a pulvinate excrescence of the mushroom itself, $1\frac{3}{4}$ of an inch broad, $\frac{3}{4}$ of an inch thick, occupied by spurious gills in the guise of subporiform jagged plates about 1 line deep, and producing sporules like those of the perfect gills beneath, but as it appeared to me rather more minute."—(p. 107).

Before concluding this paper, perhaps I may be allowed to make one or two remarks on the Morphology of the *Cryptogamia*. It is only by the observation of abnormal forms like the present, that we shall be enabled to point out what are the real relations of one form of fungus to another, and classify them according to their natural affinities. Morphology has done much for classification amongst phænogamous plants, but little or nothing amongst the cryptogamous. The 'Transactions of the Microscopical Society' contain, however, the record of a single fact of monstrosity amongst the mosses, which has afforded an interesting illustration of the application of the principles of Morphology in the higher departments of the animal kingdom; Professor E. Forbes, in his paper on the Morphology of the *Sertulariadae*, having pointed out the analogy between the change of structure taking place in those animals and the mosses, from the similarity of form in their organs of nutrition and reproduction. Have we, then, in this fungus an analogous condition to that which has been found in the higher plants? If in the fungi we regard the pileus and stipes as the representatives of the leaf or nutritive organ in the higher plants, then the hymenium must be regarded as the analogue of the flower, or reproductive organs. We may then suppose that under the influence of cold or other external agent, an arrest of development in the vegetable tissue of the fungus would be attended with the development of reproductive tissue, as we know occurs amongst the higher forms of plants. It may be objected that we need some further proof that the pileus and stipes are really the analogues of the nutritive tissue. I think that this can be clearly made out by

passing along from the fungi to the lichens and from these to the *Hepaticæ* and the mosses and ferns, where every one will allow that the green parts are the nutritive tissue of the plant and the analogues of the leaves. There is one curious point with regard to the morphological structure of the fungi which I would here point out. It is, that the whole body of the fungus is the analogue of the flower in the higher plants, the thallus of all the *Cryptogamia* being in this family at its minimum of development; the only analogue of the thallus being the mycelium, which is seen in the early part of the development of all fungi, and disappears when the hymenium is developed. I may perhaps here be allowed to mention how beautifully this fact confirms the relation of polarity which Professor E. Forbes has pointed out, as existing in every part of the animal and vegetable kingdom. The *Fungi* and the *Algæ* must be regarded as parallel groups, and in fact, up to the present moment, there is no definition that will distinguish between many of their groups, so that a whole tribe, *Byssoidæ*, are referred sometimes to one, sometimes to the other, and sometimes distributed variously through each. The characteristics of the concentrate sphere are a tendency to concentration in the organs of reproduction, to the formation of an internal skeleton in the organs of support, and to a unity in the combination of its parts. Of these three characters the fungi are a remarkable exhibition, as seen in the Agarics, and generally in the higher forms of *Hymenomycetes*. On the other hand, the characters of the articulate sphere are a tendency to elongation, the formation of an external skeleton, and articulation, all of which characters are conspicuous in the *Confervæ*, the *Laminariæ*, and other forms of the family *Algæ*. The whole fungus may then be said to be the analogue of the flower, and just in the same way as the calyx and corolla stand in the relation of nutritive organs to the more especially reproductive stamens and pistil, so do the pileus and stipes stand in the relation of nutritive organs to the hymenium.

If such, then, be the real nature of the fungi, we should expect to find that this abnormal form would be permanently normal in some members of the family. I think such forms are indicated in the clavate forms of fungi, and in the Pezizas and other exosporous fungi generally. The Rev. M. J. Berkeley also informs me that he has received from Swan River, a new species of *Secotium*, (*S. melanosporum*) in which there are two isolated patches of hymenium on the stem, and in some species of this genus the hymenium sometimes extends entirely over the top of the stem.

With regard to the small fungi developed on the pileus drawn by

Schæffer, I would suggest that these are instances of increase from adhesion. During the development of the ovules of the higher plants, adhesion frequently takes place so as to produce a double seed, or a better illustration will be found in the instances of proliferous flowers, as seen in the common daisy called hen-and-chickens.

It is then probable that such instances of multiplication in fungi arise from the same cause, and that during their early development two or more spores are developed under the same volva, and the smaller fungi are nourished through the means of the larger one, just as the smaller flowers of the daisy grow on the larger one.

In submitting these remarks to the attention of the Microscopical Society, I do it with the hope of drawing attention to an interesting department of inquiry, and not at all with the feeling that I have given that attention to the subject which its interest and importance demand.

EXPLANATION OF PART OF PLATE II.

- Fig. 5, *a*. View of stipes and pileus with abnormal hymenium of *Agaricus personatus*, from a drawing by Arthur Henfrey, Esq.
b. Pileus of the same fungus, with front view of an abnormal hymenium.
c. Vertical section of the same fungus.
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