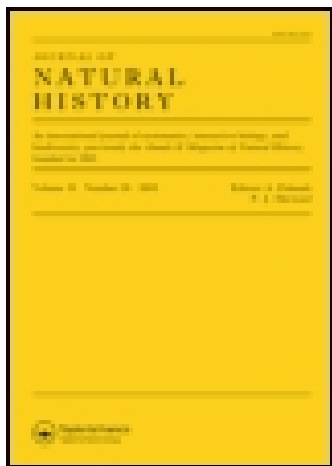


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### On Exobasidium, Woronin

H. Karsten

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been obtained, had it been honestly searched for; in proof of which I refer to the following gentlemen who were present at the lecture, all of whom are well known in Newcastle-on-Tyne, and any of whom will testify to the strict truth of this statement:—T. L. Gregson, Esq., Sheriff of Newcastle-on-Tyne, Chairman; Messrs. A. Carse and M'Kendrick, Secretaries of the Mechanics' Institute; Mr. Geo. Bell, Member of Committee; Mr. Pace, Chief Collector of Borough Rates; Mr. R. Lowry, railway goods' station; and Mr. Benson, Central Exchange News' Room,—all of Newcastle-on-Tyne. Should *Climaxodus* and *Janassa* be eventually classed as one genus, the order will then stand *Janassa bituminosa*, *J. imbricata*, *J. ovata*, and *J. vermiformis*—*J. linguæformis* being merely a synonym of *J. ovata*. Ashamed that, for the first time, I have to refute the imputation of untruthfulness,

I am,

Yours obediently,

Newcastle-on-Tyne,  
Nov. 9, 1869.

T. P. BARKAS, F.G.S.

[It is evident that, as the descriptions of Messrs. Atthey and Barkas appeared in print on the same day, there can be no question of priority of publication between them. The question really at issue is, whether Mr. Barkas's having "publicly named" the species, at a meeting of such a body as the Newcastle Mechanics' Institute, on the 28th of September 1868, gives him a priority over Mr. Atthey, whose *subsequently published paper* was read at a meeting of a recognized scientific society on the 9th of October following. We do not understand Messrs. Atthey and Hancock, in their last paper, to have cast any doubt upon Mr. Barkas's veracity; their statement seems to us simply to relate to the want of any recorded evidence, for the guidance of future palæontologists, of the species having been satisfactorily described by Mr. Barkas on the occasion to which he refers.]

*On Exobasidium, Woronin.* By H. KARSTEN.

*Fusidium vaccinii*, discovered in 1861 by Fuckel, and described and figured by him in the 'Botanische Zeitung' (p. 251, tab. 10. fig. 7), was made the subject of a thorough investigation by Woronin, who published his results, accompanied by good, characteristic figures, in the 'Bericht der Verhandl. der naturf. Gesellschaft in Freiburg' for 1867, p. 697. As Woronin found that the gonidia, which are at first unilocular, but afterwards (as indeed Fuckel figures them) multilocular, stand in fours (rarely in fives) on the summit of the clavate ends of mycelium-threads, which, standing in masses parallel to each other vertically, form a sort of hymenium, he thought justly that the fungus should be separated from the genus *Fusidium* and regarded as the type of a peculiar genus, *Exobasidium*; but he referred it incorrectly to a position among the Basidiomycetæ, on account of its gonidia being placed upon clavate sterigmata. It seemed to me, at least from the other statements of the developmental history, that this arrangement could not be justified upon this ground alone; for I had recognized the mother cell of the

fungus fruit fecundated by copulation in *Agaricus campestris* and *A. vaginatus*, and at the same time demonstrated that the fruit of the Basidiomycetæ (just like those of the Lichens which contain their seeds in tubes [*Cænogonium*], to which, according to recent observations, the Ascomycetæ approach, as indeed had been anticipated by me \*) is the product of an act of copulation of two heterogeneous cells; and therefore it might justly be required of any one who was inclined to regard a stage in the development of a fungus, in opposition to the opinion of its discoverer who occupies a high scientific position, not as a gonidial, but as a fruit-form, that he should prove that the developmental form in question was the product of a process of fecundation, or, at least, that he should endeavour to render the evidence of this as little doubtful as possible. The necessity of this proof was not thought of by Woronin, who rather considered the basidial form of the gonidiophores sufficient to enable him to form a judgment as to the nature of the fungal organization in question.

As, however, the form of the gonidia is so variable in the Fungi, and in part simulates the fruit- and seed-formation in the Ascomycetæ and Hymenomycetæ, nothing can be ascertained from it as to the position of the species to which it belongs. This conviction induced me to make a fresh investigation of this fungus, which is widely diffused in the pine-forests of North Germany upon *Vaccinium Vitis Idæa*, and occurs near Berlin from May to September.

On the mycelium of the fungus growing in the leaf-tissue of the *Vaccinium*, I was unable to detect the presence of any copulatory organs; but it does not follow that I may not have overlooked them, and therefore this can be no proof that no act of copulation takes place upon it. On the other hand, I observed, in the gonidia described by Fuckel and Woronin, developmental phenomena which are by no means in favour of these being the seeds of a Basidiomycetan, as Woronin asserts when he describes their supports as the basidia of a Hymenomycetan.

I found that the gonidia, which with very rare exceptions occur in fours upon the summit of thick cylindrical branch-cells of the mycelium, and are supported upon short, thick, bristly peduncles, frequently become cellular, both when they remain upon their supports and can become further developed, and after being shaken off or withered. This is effected, in the first place, by the extension of two nuclear cells contained in them (and already observed by Woronin) until they touch each other in the middle of their mother cell, when they form a transverse septum; then in each of these two daughter cells two new cells are again produced in the same way, and extend themselves until two new transverse septa are again produced; at the same time the mother cell (the original gonidium), which was at first bent and somewhat inclined outwards, becomes slightly increased in size, acquires a more cylindrical form, and erects itself, so that all the four cells form a longitudinally divided cylin-

\* Gesammelte Beiträge zur Anatomie und Physiologie der Pflanze, p. 341; Das Geschlechtsleben der Pflanze und die Parthenogenesis, 1860.

dricul body as a continuation of its bearer. This basidiiform supporter likewise grows, and a transverse septum is produced also in it, which is sometimes followed in the lower part by a second. This is a behaviour not yet observed in the true basidia (the seed mother cells) of the Hymenomycetæ, unless the Tremellaceæ be excepted; but in these, again, the seeds have a totally different position, and indeed it still remains to be proved that they are truly seeds—that is to say, that these Tremellaceæ are truly fruits of Hymenomycetæ.

This development of septa in the gonidia is not all, however; when they are left to their quiet and undisturbed development, new pedicles are produced at the summit of the uppermost daughter cells of each of these four gonidia; and in these, again, a daughter cell is formed, which grows into a cylindrical gonidium, resembling the original gonidium, but more regularly elongated. These four gonidia of the second order usually soon apply themselves to each other again, and lengthen the column formed by their supporter. From the summit of these secondary gonidia (gonidium mother cells), similar gonidia then again sprout forth, which behave in the same way, often subsequently, before germination and whilst still connected with the parent organism, become chambered, but not unfrequently remain simple, and in many cases do not lay themselves together; so that the chain-like connexion of each series may be easily recognized. The development is not, however, completed by the formation of this simple chain upon the original basidium, but there is not unfrequently produced from the inferior gonidia, close to the primary links of the chain, and either soon after their complete development, or even before it, a second similar generation of gonidia; so that each of these series of gonidia represents a branched, and not a simple chain.

If with this phenomenon, which is just as unprecedented in the seeds of the Hymenomycetæ as it is generally known in the gonidial forms, we consider the cameration of the so-called basidia and the development of the entire plant beneath the epidermis of the living plant on which it subsists, without the recognition of any mother cell of the hymenium, such as I have demonstrated in the case of *Cœnogonium*, and such as likewise exists, so far as I know, in the *Æcidaceæ*, *Hymenomycetæ*, and *Ascomycetæ*, these developmental phenomena certainly furnish no proof that this parasite belongs to the Basidiomycetæ; but still less do they characterize this developmental stage (which has been called *Exobasidium* as the fruit and its gonidia) as the seeds of a Hymenomycetan. It cannot, therefore, be referred to the Basidiomycetæ unconditionally until further investigations have shown that it (probably as a gonidial form) really belongs to a Basidiomycetan. The same doubt, with regard to the signification of the known organs of reproduction, which I have here raised in the case of *Exobasidium*, applies also to *Taphrina*, F. Tul. (*Exoascus*, Fuckel), which has, certainly with justice, been described by Woronin as a developmental stage analogous to *Exobasidium*. Both are to be regarded for the present as gonidial stages, and placed among the Coniomycetæ.—Communicated by the Author.