

A Note on Sterigmata in General.*

By

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The sterigmata in *Tulasnella* and *Gloeotulasnella* develop in three phases. First, they grow out into the swollen, spore-shaped bodies which have attracted so much attention. Secondly, after these voluminous bodies have reached their maximal size and gone through an outwardly stationary period (nuclear division in certain species), they emit an outgrowth, rather conical and short in *Tulasnella* and rather finger-shaped and longer in *Gloeotulasnella*. Finally these outgrowths produce apically pointed tips on which are formed the basidiospores to be shot away at maturity. I propose to call the successive portions protosterigma, secondary protosterigma, and spiculum (1) respectively.

The formation of a secondary protosterigma is not of common occurrence among hymenomycetes. Except in *Tulasnella* (where they may be indistinct) and *Gloeotulasnella* it is encountered in many gelatinous Heterobasidiae, like Tremellaceae, for instance in *Tremella* Fr. and *Exidia* Fr. (2). In these instances the basidia are deeply embedded in a gelatinous matrix. They send out towards the surface (primary) protosterigmata, starting as globular buds which elongate into hypha-like threads and, after having stopped growth just below the surface of the fruit-body, become more or less clavate in their upper portion. Much of the protoplasmatic contents of the basidium-cells accumulates here. Next this clavate and rounded apical portion emits a more slender outgrowth, the secondary protosterigma, which, as it reaches beyond the surface, produces the spiculum and the basidiospore. It would appear that the differentiation into a primary and secondary protosterigma is largely due to a temporary interruption of the growth of the sterigma. This may be interpreted as a rest-period, but it is more likely to be one of internal activity preparatory to the quick formation of the spiculum and ballistospore at such a great distance from the basidial body which usually plays the important rôle in the process of violent discharge of the spore. More often the protosterigma develops without interruption until it has formed its spore and no secondary protosterigma is discernible.

The definition of a protosterigma should perhaps be: that part of the sterigma which bears the spiculum, or, in terms of development: a sterigma before it has formed the spiculum. (The full-grown sterigma might be termed a metasterigma.) This makes the protosterigma an outgrowth of the basidium, which, either very soon when it is still a minute, more or less rounded bud, or after growing out characteristically and considerably, forms the spiculum; it also makes the protosterigma a universal feature of those basidiomycetes that discharge their spores forcibly. It may be assumed that even the delicate sterigma starts as a nipple- to knob-like protuberance that rapidly produces the spiculum.

* This note originally formed part of a manuscript dealing with what I would call the tulasnelloid fungi. These are, for instance, characterised by their basidiospores exhibiting repetition.

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(1) The term "spiculum" is taken from L. R. Tulasne (in Ann. Sci. nat., Bot. iii 19: 196, 1853) who interchanged it with "sterigma". It is here restricted, in accord with its etymology, to the pointed tip of a sterigma upon which the violently discharged spore is produced.

(2) Compare G. W. Martin in Mycologia 37: 534, 1945. For figures, see for instance, Brefeld (Unters. Gesamtgeb. Mykol. 7: pls. 5-7) and G. W. Martin (in Univ. Iowa Stud. nat. Hist. 18 (3): f. 17, 1944.

That the protosterigma is often not noticed would be accounted for by the facts (i) that its formation and the subsequent production of the spiculum take such a short time that the intermediate stages are only exceptionally seen, and (ii) that the smaller sterigmata when full-grown do not show any appreciable outer differentiation into protosterigma and spiculum. This lack of differentiation at maturity is typical of all horn-shaped (outward curved and slender-conical) sterigmata, but yet I have been able to find the bud-like protosterigma in many cases and in modern literature it is even now and then depicted. Among the heterobasidious fungi it is usually considerably developed, often up to hypha-like or slender-clavate; in *Ceratobasidium* and in certain species of *Botryobasidium* it is finger-shaped and usually somewhat ventricosely swollen at the time that the sterigma starts producing the spore; in *Tulasnella* it is a voluminous, ovoid body before it grows out further.

Protosterigmata, when they are well developed, are now often called epibasidia, and simultaneously the term sterigma is restricted to the spiculum. Since I can neither accept a term that covers besides protosterigmata (*Tulasnella*, *Tremella*) also metabasidia (*Auricularia*), nor a terminology that does not homologize the sterigmata of *Tremella* with those of *Auricularia*, I have abandoned such a confusing term as epibasidia altogether⁽³⁾. For those appendages of the metabasidia called epibasidia by Neuhoff and Rogers the new term protosterigmata might appear a convenient substitute, but it should not be forgotten that less well developed protosterigmata occur throughout the hymenomycetes. "Epibasidia" may be very small and practically totally reduced even in Tremellales; compare, for instance *Sebacina obscura* G. W. Mart⁽⁴⁾.

Not all hymenomycetes exhibit violent spore discharge. There are a few genera that produce sticky spores which become freed by hydrolysis (slime spores) or by breaking off by mechanical disturbance from outside (dry spores)⁽⁵⁾. Examples of the first are *Hoehnelomyces* Weese (Auriculariaceae-Phleogenoideae) and *Sirobasidium* Lagerh. & Pat. and *Hyaloria* A. Möll (Tremellaceae); of the second *Phleogena* Link. (Auriculariaceae-Phleogenoideae) and *Xenolachne* D. P. Rogers (Tremellaceae). Basidia that do not forcibly discharge their spores have been called apobasidia by D. P. Rogers⁽⁶⁾; if such a term is needed at all, one is forced to provide also for a companion term for basidia that do (ballistobasidia).

Spores that are not forcibly discharged may be either sessile (*Phleogena*, *Hoehnelomyces*, *Sirobasidium*) or borne on sterigmata (*Hyaloria*, *Xenolachne*). In the latter case the sterigmata lack the spiculum (which evidently plays an important rôle in the process of ballistospore discharge) and the whole of them would appear comparable to the protosterigma, a term which thus becomes superfluous here.

⁽³⁾ Donk in Meded. Nederl. Mycol. Ver. 18-20: 78-81. 3 fs. 1931.

⁽⁴⁾ G. W. Martin in Lloydia 7: 70. f. 5. 1944.

⁽⁵⁾ Mason, Annot. Account Fungi recd, List ii, Fasc. 3: 77, 1937.

⁽⁶⁾ In Mycologia 39: 558, 1947. It should be recalled that the term apobasidium was originally coined by Vuillemin (Champignons 349, 1912) for a much more inclusive notion.