

of the work of Singer.¹ As frequently happens when such a publication appears, and it is possible for other mycologists to critically evaluate their collections, interesting results are obtained. In this instance the first species to come to our attention was found to be undescribed. As a final check, material of the Ohio collection was sent to Dr. Singer for examination. He verified our opinion that the fungus was undescribed, but closely related to *C. hirsiceps* (Peck) Singer. The outstanding character of the fungus, and the one emphasized by Dr. Singer in his letter, is the shape of the cheilocystidia. Since the fungus differs from *C. hirsiceps* in other characters as well, we have described it as a species rather than as a variety of Peck's species. Habitat is an important character in *Crinipellis*, and to say the least, the habitat of *C. maxima* is peculiar, although more observations are needed to verify that the fungus is not typically lignicolous. Although the cluster was found growing in a mixture of shale fragments and the clay-like mud into which the shale disintegrates, it was actually very close to the root-tangled bank and the mycelium could easily have been attached to rotting roots. The brook bed was in the bottom of a ravine heavily wooded with a mixture of deciduous trees. Figure 1 shows the manner in which the carpophores develop from the mycelial strands.

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¹ A monographic study of the genera *Crinipellis* and *Chaetocnathus*. De Lilloa 8: 441-534. 1942.

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NOMENCLATURE OF FUNGI

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Everyone who uses scientific names may be affected by rules of nomenclature. Mycologists get along surprisingly well with their nomenclature, considering the small amount of effort most of them have given to the formulation of rules for their guidance. A review of some of their nomenclatural problems, and suggestions for a few possible interpretations, revisions, or additions to the rules may, it is hoped, prove useful for discussion; especially since the adoption in 1930 of the type method necessitates reconsideration of much past procedure.

The International Rules of Botanical Nomenclature, first adopted at Vienna in 1905, were based on de Candolle's "Lois" of 1867. These rules covered many of the fundamental problems of nomenclature of all plants. Fungi were not specifically considered. The Brussels Congress in 1910 revised the rules and added (evidently from proposals by Saccardo (1), who did much to keep mycological nomenclature on a fairly even keel, and by a group of American mycologists (2)) the articles now numbered 57 and 20, and three or four recommendations, all applying definitely to fungi. This second edition of the rules, published 1912, was followed by the third (the present) edition printed in 1935 which, as regards fungi, has practically no change from the second except the addition of Recommendations VI and VII and a list of proposed *nomina generica conservanda*. The Congress at Amsterdam in 1935 did not pass alterations specifically affecting nomenclature of fungi.

Meanwhile certain American workers had done valuable work for nomenclature in developing the "American Code."

Mycologists could, if they wished, formulate their own rules of nomenclature (as was recommended by a number of botanists at Vienna), but I presume the majority would now vote to continue to follow, after emendation, the rules used by other botanists.

Nomenclature cannot answer questions of taxonomy. Though it aims at fixity of names, the avoidance of error, of ambiguity, and of useless creation of names, it must recognize that an author is at liberty to combine generic names and specific epithets, or to propose families or orders, in any way that seems best to him. If, inadvertently or deliberately, he breaks the rules others who follow them—the majority of mycologists—will correct his nomenclature or ignore his work.

The rules do not attempt to obviate the use of judgment; on the contrary, the suggestion is made that their spirit rather than their letter should be followed: "In the absence of any relevant rule, or where the consequences of rules are doubtful, established custom must be followed." This is one of the principles upon which the rules are based.

At the present time there are two important rules concerning which differences of opinion obtain. The first is Article 57 dealing with the nomenclature of the different "successive states" of a species and the second is Article 20f regarding the starting points of the various groups. In the following paragraphs I venture to outline my personal views on these articles in the hope that they will help to clarify the situation.

SPECIES, STATES, AND ARTICLE 57. "Names of species are binary combinations consisting of the name of the genus followed by a single specific epithet" (Art. 27). Nomenclature does not presume to say what shall constitute a species, except that its name should have a type specimen or preparation, though a description or figure may suffice. The rules also recognize that, in fungi, names are often given to imperfect states.

A state of a species of fungi is imperfect or perfect. An imperfect state may be a mycelial, a spermogonial, a pycnidial, or other conidial state. The perfect state is that which produces basidiospores, ascospores, zygosporangia, or oöspores, together with associated structures which protect these spores.

"Stage" is commonly used as a synonym of "state," but "stage" involves an idea of regular succession, whereas states of fungi may occur simultaneously or in varying order.

Let us consider a few examples.

1. Most fungi have mycelium. This vegetative state is seldom named unless it has distinctive mycelial structures; then, if it seems advisable, the state can be considered to represent a species pending further information, given a binomial which has the same rules and rights as any other binomial, and the name classified in the Mycelia Sterilia of the Fungi Imperfecti. Examples: *Sclerotium durum* Fries,¹ *Rhizoctonia Crocorum* Fries.

2. A fungus may have a spore-producing imperfect state (and generally mycelium also, though this may not be evident unless the fungus is grown in culture). This state is usually self-perpetuating and, if it is the only one known, it needs and gets a binomial. This name also represents a good species of the Fungi Imperfecti, at least *pro tem*.

Mycologists formerly assumed that the large group of Fungi Imperfecti would gradually disappear through the discovery of perfect states, and considered that each species then should bear only one name, that of the perfect state: the rules still say "generic and specific names given to other states have only a temporary value." Mycologists now realize, however, that the temporary value commonly becomes permanent. It has become "established custom" to continue to use the name of an imperfect state, after its perfect state is demonstrated, if this be necessary or desirable in order to avoid ambiguity. Thus *Helicobasidium purpureum* Pat. has been shown to be the perfect state of *Rhizoctonia Crocorum*; but the latter binomial may, so far as known, represent the species in various regions or examples. Its use obviates the circumlocution "*H. purpureum* Pat., stat. mycel. steril." Furthermore, it may not be certain that *H. purpureum* represents the perfect state of *all* that passes under the name of *R. Crocorum*. In order to recognize these facts, it seems better to say that the "name applied to the . . . perfect form shall take precedence," as was proposed in 1910 (2). It will also be understood that the type specimen of *R. Crocorum* could be

¹Or *S. durum* Pers. ex Fr. Pre-Friesia (and other pre-valid) authors and names are here omitted, just as Phanerogamists generally omit pre-Linnaean. In formal taxonomic treatises, especially if a specimen of Persoon's had been found or chosen as type, "Pers. ex Fr." would be more explanatory and accurate.

designated the type of its *Helicobasidium* only if it were definitely

(1912)" I take it that the binomial should be cited "*M. Aleuritidis*

designated the type of its *Helicobasidium* only if it were definitely found to bear that perfect state.

3. A species having a named mycelial state (e.g. *Sclerotium durum*) may prove to have also a conidial state (*Botrytis cinerea* Fries). Both belong to the Fungi Imperfecti, but a spore-producing state is generally recognized as "higher" than (*i.e.*, takes precedence over) a mycelial state, and, as it became clear that both are regularly associated, the name *S. durum* rightly fell out of common use. Though the rules do not (and probably cannot) provide for the extinction of a binomial, the name *S. durum* should be used only in exceptional instances (say in a monograph of *Sclerotium*) for the name of a state of a species. But it seems most unlikely that *B. cinerea* will in turn be so nearly completely superseded by the name of its supposed perfect state, *Sclerotinia Fuckeliana* (de Bary) Fuckel.

4. A species may be known as a perfect state (and generally mycelium) only. An un-named conidial state found later must not, according to the present rules, receive a binomial in the Fungi Imperfecti. "Established custom"—a Principle—sometimes overrides this rule, but should do so only when distinct advantage is gained. If it be demonstrated that a conidial state with a prior name belongs to a species with a named perfect state, the rules say that one cannot legally propose a new combination and the type method makes this impossible unless the type specimen of the imperfect state also bears the perfect. In the Uredinales, however, the usual practice is to accept *Uredo* names as having equal status with names applied to telia. Arthur and others hold that is is legal because the uredo state is part of the perfect state.

5. A perfect state may be demonstrated for a species previously known only as a named imperfect state. According to my reading of the present rules, the "temporary value" of the latter name would end when the perfect state was described and named, the type specimen of the perfect state was described and named, the type specimen of the specific name would be that of the perfect state, and the name of the imperfect state should be dropped or cited only as a synonym. If, for example, a perfect state is described and named "*Mycosphaerella Aleuritidis* (Miyake) Ou (1940), syn. [the imperfect state] *Cercospora Aleuritidis* Miyake

(1912)" I take it that the binomial should be cited "*M. Aleuritidis* Ou (1940)," since the type specimen of the name of a *Cercospora* cannot (or at least should not) be made the type specimen of the name of a *Mycosphaerella* unless the specimen is shown to bear the perfect state. Once more, however, a wording that "the name of the perfect state takes precedence" should legalize the retention, when advisable, of the binomial *C. Aleuritidis* for the imperfect state.

6. A few species (e.g. of *Aspergillus* and *Penicillium*) have perfect and imperfect states, but a name for the imperfect state only. This usage fulfils the principle of "avoidance of all useless creation of names," but if continued perhaps should be regularized by conserving the generic name (or redefining the genus) to include the perfect state.

These numbered paragraphs apply to Fungi Imperfecti on the one hand, to Basidiomycetes and especially Ascomycetes on the other. But the imperfect states of Phycomycetes—commonly more important or distinctive than the perfect state, if that be produced—are seldom classified in the Fungi Imperfecti. It is "established custom" to accept the first valid epithet or generic name applied to either state of a Phycomycete, and Article 57 does not forbid this custom for Phycomycetes. The custom could not now be changed without introducing much uncertainty as to names and authors of numerous Phycomycetes (3, 4).

The re-wording of Article 57 should depend largely upon the views of the majority of mycologists upon such examples and principles as are given above. I suggest this for your criticism:

57. In Ascomycetes and Basidiomycetes (but not Phycomycetes) with pleomorphic life-cycle, the first valid name or epithet applied to the perfect state (that producing asci or basidia, together with the appropriate associated structures; in Uredinales, to the *Uredo* or telial stage) takes precedence. Similarly, the name or epithet of a spore-producing state takes precedence over that applied to a mycelial state. The type specimen of a state must bear that state. The author who first describes a perfect state is at liberty to use the specific epithet of the imperfect state, but his binomial of the perfect state is to be attributed to him alone.

ARTICLE 20F. Various interpretations can be given to the words "Legitimate botanical nomenclature begins for Fungi caeteri [Eumycetes, excluding Uredinales, Ustilaginales, and Gasteromycetes] at 1821-32 (Fries, *Systema mycologicum*). The American proposal (2) stated: "we are in favour of adopting Fries's *Systema* in view of the fact that it includes a much larger number [than Persoon's *Synopsis*] of widely distributed genera and species." From this, and from experience, I gather that validation was intended to apply, and should apply, mainly to specific epithets and generic names. Please criticize this procedure: given a pre-*Systema* binomial, start with the epithet. If found (say *via* the Index of vol. III, under any generic name) accepted in *Systema* vol. I (1821), vol. II (1822 or 1823), or vol. III (1829 or 1832), consider the epithet validated by that acceptance and at that date, regardless of the group in which Fries placed it (5, 6, 7, 8). Similarly, but secondarily, proceed with the generic name. Pay attention to "validation" by Fries of higher groups only in this sense: an epithet or generic name not included in the *Systema* is not in need of validation if published after Fries had dealt with the genus or higher group to which it belongs; e.g., all epithets of *Agaricus*, and most epithets and generic names of other Hymenomycetes, are "post-*Systema*" if published after Jan. 1, 1821; but most Hyphomycetes remain "pre-*Systema*" until after 1832. As for *Elenchus* I and II (both 1828), I give it no more "priority" than any other work of the same date (but see 10). It is true that Fries cites his *Elenchus* in the Index to the *Systema*; but he also cites references to *Linnaea*.

OTHER COMMENT. The American proposal of 1910 (2) recommended: "The subdivisions, or 'tribes,' of *Agaricus* used by Fries in his *Systema Mycologicum* are to be treated as having been employed as genera at the time of publication of this work." This was not adopted at Brussels, but was proposed anew by Dodge in 1934 (9). Dodge's proposal was not adopted at Amsterdam, but is still before Congress, so that one may now cite names and authorities of agarics either way. It is evident that mycologists, particularly those dealing with taxonomy of Agaricaceae, should give this proposal their considered opinion. I believe that phanerogamists would (or at least should) not

outvote mycologists if the latter can present the view of the majority.

Likewise, though proposals for *nomina specifica conservanda* have been rejected by Congress, I (3, 4) am anxious to know and to accept the verdict of the majority of mycologists on such a proposal for names of fungi. Let us take steps to ascertain that verdict.

There is no objective test for "right and wrong" in nomenclature. The rules can be enforced only so far as they are "used by the great majority of botanists in all countries" (Art. 1). Let us have thought, discussion, and considered opinion on proposed amendments. It seems to me that mycologists—at least, as a start, in English-speaking parts of the world—should be able to come to an agreement on most of the points at issue over rules of nomenclature. But all that I have written above gives merely my own views (at present), and is offered for your criticism.

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