

## A new nomenclature for fungi

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**Abstract:** Important changes brought about by the Melbourne *International Code of Nomenclature for Algae, Fungi and Plants* are briefly reviewed concerning a clarification of the spelling and typification of sanctioned fungal names, the recognition of electronic publication for the validity of nomenclatural novelties, permission to use English diagnoses or descriptions for their valid publication, and the requirement of registration of such novelties with an identifier number issued by a registration repository. The most drastic change, the abolishment of the former Article 59 permitting a dual nomenclature for pleomorphic fungi, is outlined in more detail. From 2013 onwards the introduction of two names for different morphs of a fungus will render both names invalid. In the choice between names applied to anamorphs and teleomorphs priority would have free play. To avoid countless ensuing name changes, the previous rule-determined system of nomenclature is being replaced by a committee-determined list-based nomenclature. Suggestions for reducing the necessary name changes to a minimum have been proposed.

**Keywords:** taxonomy, phylogeny, classification

### INTRODUCTION

The publication on 20 Dec. 2012 of the new *International Code of Nomenclature for Algae, Fungi and Plants* (the ICN, superseding the former *International Code of Botanical Nomenclature*, the ICBN; McNeill et al. 2012) marks the most drastic change in fungal nomenclature since many decades. This *Code* is the result of the Nomenclature sessions preceding the XVIII International Botanical Congress in Melbourne and ratified on 30 July 2011, thus the *Melbourne Code*. The online version differs from the printed book in that it lacks Latin-name- and subject indexes, but it has convenient general survey left column that leads directly to the individual Articles. The various appendixes will be published separately online. Note that a few Articles have got changed numbers.

The changes enacted have already been summarized by Norvell (2012) and Hawksworth (2012). I shall also review them briefly and go into details concerning the Articles dealing with the names of pleomorphic fungi.

### Important changes

1. Spelling and typification of **sanctioned fungal names** have been clarified in a modification of Art. 15.1 as proposed by Demoulin and modified at the Congress: "The spelling used by a sanctioning author is treated as conserved, except for changes mandated by Art. 60." Art. 9.10 says: "The type of a name of a species or infraspecific taxon adopted in one of the works specified in Art. 13.1(d), and thereby sanctioned (Art. 15), may be selected from among the elements associated with the name in the protologue and/or the sanctioning treatment." Art. 9.2 in addition specifies: "For sanctioned names, a lectotype may be selected from among elements associated with either or both the protologue and the sanctioning treatment (Art. 9.10)." More details are given by Norvell (2011).

2. The date of an **electronic publication** can be recognized as basis for a more rapid and valid introduction of novelties (Art. 29.1) from 2012 onwards: "... Publication is also effected by distribution on or after 1 January 2012 of electronic material in Portable Document Format (PDF; see also Art. 29.3 and Rec. 29A.1) in an online publication with an International Standard Serial Number (ISSN) or an International Standard Book Number (ISBN)." But Art. 30.2 clarifies: "An electronic publication is not effectively published if there is evidence within or associated with the publication that it is merely a preliminary version that was, or is to be, replaced by a version that the publisher considers final, in which case only that final version is effectively published." This will often be the case when the first online placement of a journal paper is not yet paginated. Knapp et al. (2011) give a full account of the context.

3. **Latin diagnoses** are no longer required for the valid publication of a new taxon. After decades of controversial debates on the desirability of diagnoses in the *Lingua franca* Latin, a proposal by Demoulin, strongly supported by the Nomenclature Committee for Fungi (NCF), not only got accepted, but by a proposal from the floor was extended to all names covered by this *Code*. **Art. 39.2** (formerly Art. 36) now reads: "In order to be validly published, a name of a new taxon published on or after 1 January 2012 must be accompanied by a Latin or English description or diagnosis or by a reference (Art. 38.13) to a previously and effectively

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published Latin or English description or diagnosis". Until that date, the requirement of a Latin diagnosis is retained as a prerequisite for validity (Art. 39.1). While it was previously the function of a Latin diagnosis to convey the essential features of a taxon most concisely, generally without repeating the detailed description, a summarizing diagnosis is not explicitly required in English. But it may be a good practice to let the full description be preceded by a concise diagnosis in English (if not Latin). Some knowledge of Latin will remain indispensable to coin correct Latin names of the organisms and to understand the old literature.

4. In order to be validly published, any **nomenclatural novelty must be registered** by the author who submits the information to a repository such as MycoBank ([www.mycobank.org](http://www.mycobank.org), Crous et al. 2004), who then issues an identifier number that must be included in the publication. This has already been good mycological practice in the last decade and was editorially required by several renowned periodicals, but the new **Art. 42.1** now demands: "For names of new taxa, new combinations, names at new ranks, or replacement names designating organisms treated as fungi (including fossil fungi and lichen-forming fungi) under this *Code* (Preamble 8) and published on or after 1 January 2013, the citation in the protologue of the **identifier** issued by a recognized repository for the name (Art. 42.3) is an additional requirement for valid publication." By an international agreement, *MycoBank*, *Index of Fungi* and the Chinese *Fungal Names* are now recognized and act as coordinated repositories for this purpose. A recommendation says that also actions of typification should be registered in this way (without creating a new record in the data base).

### **Pleomorphic fungi – anamorphs and teleomorphs**

In the past era of morphology-based taxonomy, anamorphs (asexual forms of sporulation) and teleomorphs (sexual forms) of fungi often were discovered and described independently and could receive different but valid and legitimate names, as ruled by Art. 59 ICBN. This situation of dual nomenclature was an abnormality conflicting with biological philosophy, in which a type is the type of a single organism that can have only one name. No conditions can normally be imposed on the quality of a type, but in the case of pleomorphic fungi the presence of a sexual form of sporulation was made a prerequisite for inclusion of a fungus in a teleomorph-based genus, otherwise it would have to be in an anamorph-based genus. This time-honoured system had great advantages for a morphological identification and communication about ecological features (conditions for development of anamorph and teleomorph are often different). In the present era

of phylogenetic molecular analyses the coordination of the anamorphic and the teleomorphic element of a fungus can in principle unequivocally be established. Molecular mycologists have therefore been the driving forces striving for a consistent unification of fungal nomenclature. The mycological community has been strongly divided on this issue as clearly shown by Seifert et al. (2003) and in debates by a special committee installed to elucidate this issue, guided by Scott Redhead.

A ruling accepted at the XVII Botanical Congress in Vienna permitted the 'epitypification' of so far anamorphic fungi with teleomorphic material so that its name would also cover the teleomorph, in order to avoid introducing a separate name for the teleomorph. This somewhat liberal ruling was not unequivocally welcomed (Gams et al. 2011 a, b). Redhead (2010) suggested for this mechanism the term 'teleotypification', because the procedure is somewhat different from epitypification as used frequently since 2001 for fixing the identity of a taxon, usually with material that can be analysed with molecular tools. This new term has not made it into the *Code* at Melbourne. Nevertheless, the mechanism is useful and likely to be widely applied in the future.

In 2011 a meeting '1 Fungus = 1 Name' was organized by CBS in Amsterdam that resulted in the 'Amsterdam Declaration' signed by some 80 participants, most of them applied mycologists, (Hawksworth et al. 2011) that strongly defended the move to a unified nomenclature. This declaration was firmly opposed by Gams et al. (2011) in a paper signed by some 70 leading fungal taxonomists, who did not consider the time ripe for such a change, which would entail innumerable, mostly unnecessary name changes. So far insufficient numbers of higher fungi had been sufficiently studied to achieve a better correlation between teleomorph- and anamorph genera. This incongruence in genus and even species concepts is the main obstacle for a unification at the present time.

At the Nomenclature session in Melbourne, Redhead had intended to present a series of proposals concerning Art. 59. He started with the most drastic one to abolish the former Art. 59 altogether, expecting that it would not be accepted, so that a more moderate proposal could then be offered. To the surprise of the mycologists present, the botanical community immediately endorsed the first proposal made with the following result.

The new version of the previously very complex Article 59.1 simply says: "A name published prior to 1 January 2013 for a taxon of non-lichen-forming *Ascomycota* and *Basidiomycota*, with the intent or implied intent of applying to or being typified by one particular morph (e.g. anamorph or teleomorph), may be legitimate even if it otherwise would be illegitimate under Art. 52 on account of the protologue including a type (as defined in Art. 52.2) referable to a different morph. If the name is otherwise legitimate, it competes

for priority (Art. 11.3 and 11.4; see also Art. 57.2).” As specified in Art. 36.2 (formerly Art. 34.2), the simultaneous introduction of two names for different morphs of a fungus will render this action invalid from 1 Jan. 2013 onward. Otherwise, a newly introduced morph name for a previously named organism will be illegitimate. Article 57.2 then specifies: “In pleomorphic fungi (including lichenicolous fungi, but excluding lichen-forming fungi and those fungi traditionally associated with them taxonomically, e.g. *Mycocaliciaceae*), in cases where, prior to 1 January 2013, both teleomorph-typified and anamorph-typified names were widely used for a taxon, an anamorph-typified name that has priority is not to displace the teleomorph name(s) unless and until a proposal to reject the former under Art. 56.1 or 56.3 or to deal with the latter under Art. 14.1 or 14.13 has been submitted and rejected.” These latter Articles 14.12 (conservation) and 56.2 (rejection) contain the clause: “The lists of conserved /suppressed names will remain permanently open for additions and changes. Any proposal (of an additional name/ for rejection of a name) must be accompanied by a detailed statement of the cases both for and against its conservation/rejection, including considerations of typification. Such proposals must be submitted to the General Committee (see Div. III), which will refer them for examination to the committees for the various taxonomic groups.”

This ruling thus generally sacrifices the so far prevailing precedence of teleomorph-based names over those for anamorphs. The completely free play of priority would cause vast numbers of undesirable name changes. To avoid these, the mechanism of committee decisions on listed names is introduced to supersede the previous rule-determined system of nomenclature. This situation places a huge burden on committees of specialists to compose such lists, which will first be placed on the Internet before being sanctioned by the responsible committees as described above. Thus a highly controversial situation is created that is unlikely to be quickly settled contrary to the expectation by Hawksworth (2012). The system may work if *all* competent taxonomists participate in the effort, but who assures that the most competent specialists of a group have the saying? There are many fungal groups for which no specialist is presently available. Thus it would be best if such cases for the time being are not yet placed on a list at all.

To aid decisions by these committees, Gams et al. (2012 a, b) made suggestions to (a) differentiate between a more flexible system of ‘prioritized/suppressed’ (in the 2012b paper) or better ‘*list-accepted/list-demoted*’ (2012a) names contrasting them with irreversibly conserved/rejected names, the product of a much more formal procedure; (b) recommending granting preference to teleomorph-

based generic names, whenever possible; (c) if the oldest epithet of a fungus has been published in a list-demoted genus this should not be recombined into the accepted genus when a well-established binomial is already available in that genus; (d) binomials are to be retained in list-demoted genera if they lack molecular evidence, while awaiting a reliable proof of their phylogenetic affinity (e.g. most species of *Mycosphaerella* vs. the species of *Ramularia* adopted for *Mycosphaerella* in the strictest sense) and if different taxonomies have been used for different parts of a genus. While the older generic name *Trichoderma* is now generally preferred over the associated teleomorph name *Hypocrea*, there is little objection against retaining the generic name *Hypocrea* for species of the *H. citrine* clade, which have little-differentiated, not trichoderma-like anamorphs, or species of other clades that lack an anamorph altogether. A unification of specific binomials thus appears easier than the strict unification of generic names, which may be less urgent.

Our suggestion (c) resembles the so-called ‘Kew rule’ of botany, which was never recognized in the *Code*, but it could now easily be put into practice when the responsible committees make their choice of names to be listed. On a similar line, Braun (2012) reached a comparable conclusion, because many pairs of so far legitimate anamorph-teleomorph names are not each other’s homotypic synonyms and merging them may not be justified. Thus both names continue to be available for use as also stated by Hawksworth (2012). Instructive examples include the name pairs *Aspergillus niveus* Blochwitz – *Fennellia nivea* (B.J. Wiley & E.G. Simmons) Samson and *Aspergillus flavipes* (Bainier & R. Sartory) Thom & Church – *Fennellia flavipes* B.J. Wiley & E.G. Simmons, which turned out not to be conspecific in a molecular study (Peterson 2000), and even more drastic: *Trichoderma viridescens* (A.S. Horne & H.S. Will.) Jaklitsch & Samuels – *Hypocrea viridescens* Jaklitsch & Samuels, which in the first instance (Jaklitsch et al. 2006) were regarded as conspecific in spite of somewhat deviating elongation factor (*tef1*) sequences, in a refined multigene analysis (Jaklitsch et al. 2013) turned out to be distinct species, with the consequence that the latter was renamed *Trichoderma paraviridescens* Jaklitsch et al. Moreover, ‘orphaned’ species often remain in list-demoted genera and cannot yet be transferred (Hawksworth 2012). Some kind of cryptic dual nomenclature is thus bound to persist at least for generic names.

In many fungal groups morphology alone is no longer sufficient to reliably distinguish extant species, although within a limited geographical region this approach may still be satisfactory. For many purposes, especially ecological work, the morphological recognition of a species remains indispensable. Therefore serious mycologists must not follow the fashion to declare the morphological approach bankrupt. It is the combination of both morphology and other phenotypic criteria with molecular work that matters.

The best modern taxonomic monographs show that the phenotypic findings have helped in critically sorting the possible molecular interpretations.

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