

**POSSIBILITIES TO AMEND OR DELETE ARTICLE 59 OF THE
INTERNATIONAL CODE OF BOTANICAL NOMENCLATURE TO ACHIEVE
A UNIFIED NOMENCLATURE AND CLASSIFICATION OF THE FUNGI**

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Abstract: Phylogenetic research helps fungal taxonomy being based on solid grounds. Therefore the distinction of anamorph and teleomorph names, granted as an exception to Principle IV by Article 59 of ICBN, is strictly speaking no longer needed. The presently used dual nomenclature is based on anatomical typification, in which an anamorphic specimen can only serve to document an anamorph taxon. To remove the dual nomenclature in pleomorphic fungi, three mechanisms are proposed. To achieve a unified nomenclature, it will be necessary, from a certain date onward, to extend typification of all taxa to holomorphic application. Abandoning Art. 59 right away would lead to nomenclatural chaos. To minimize the necessary name changes, six possible procedures are proposed that might achieve a unified nomenclature.

Keywords: anamorphic fungi, anamorph-teleomorph correlation, holomorph, pleomorphic fungi, typification, unified nomenclature.

INTRODUCTION

The *International Code of Botanical Nomenclature* (ICBN, the *Code*) includes several specific sets of rules that have been introduced to comply with the needs of certain disciplines such as mycology. The most outstanding mycological provision is Art. 59 which grants an exception to the principle IV of the *Code*: one organism -- one name, a principle already expressed in the *Lois de la Nomenclature Botanique*, Art. 15 of De Candolle (1867). Dual nomenclature started with Saccardo who, in his *De Diagnostica et Nomenclatura mycologica* (1904), recommended the designation of pleomorphic fungi by their respective names both in the *Fungi Perfecti* and in the *Fungi Imperfecti*. The matter, submitted to the International Botanical Congress of Vienna in 1905 (Briquet, 1905), was left to the International Commission of Botanical Nomenclature whose proposal (Atkinson, 1909) integrating the positions of the Tulasnes and of Saccardo, was adopted by the Brussels Botanical Congress and formulated as Art. 49 bis in the Brussels ICBN (Briquet, 1912), the first rule of nomenclature for pleomorphic fungi introduced to specifically resolve the problems of competing names. That rule recognised prevalence of the name of the perfect state of Ascomycetes and Basidiomycetes over the names of their imperfect states classified as “form-taxa” and assessed with “only a temporary value” perhaps hoping that they would become obsolete. But the Stockholm Code (Lanjouw *et al.*, 1952) accepted for the first time, in Art. 69 (later Art. 59), the creation of new names for imperfect states of already named pleomorphic fungi, forgetting the presumed “temporary value” of such names.

NOTE. The existence of a dual nomenclature in Higher Fungi besides a unique nomenclature in Lower Fungi incited some British mycologists in 1929, claiming for uniformity and coherence in the nomenclature of the fungi to introduce a proposal to extend the rule 49 bis (today 59) to the Zygomycetes and the Phycomyces (Mastigomycetes), although contrary to principle IV of nomenclature. The proposal was fortunately defeated at the Botanical Congress of Cambridge in 1930 (Briquet, 1935).

Art. 59 has served mycologists well in the one and a half centuries that the morphological recognition of teleomorphic and anamorphic sporulating structures existed side-by-side, with only occasional cross-links between correlated morphs. This system was workable, but it had the disadvantage that dual names for interconnected taxa confuse users and anamorph names did not show any affinities to particular higher ranks in teleomorph classification (Seifert & Samuels, 2000; Cannon & Kirk, 2000). Although lists of organic connections recognized between anamorphs and teleomorphs have been published (Sutton, 1977; Kendrick & Di Cosmo, 1979; Kendrick & Watling, 1979; Sutton, 1980; Carmichael *et al.*, 1980; Kendrick Ana-teleo Database at <www.biology.ualberta.ca/jbrzusto/anatel.php>, now at CBS website), and shall be extended in the near future (Seifert *et al.*, 2003), a residue of anamorphic fungi will remain unconnected, which either possess hidden mechanisms of sexuality like a parasexual cycle or have lost sexuality altogether. Thanks to the advent of molecular methods, a more sophisticated phylogenetic taxonomy can be established in which anamorph taxa can be more or less fully integrated in the teleomorph-based classification.

After the high votes during the Reynolds & Taylor conference “*The Fungal Holomorph*” in 1992 to discontinue using the categories Deuteromycotina and sub-categories Hyphomycetes, Coelomycetes and others as formal taxa (Hawksworth, 1993), these names are used here as decapitalized terms. The 9th edition of the *Dictionary of Fungi* (Kirk *et al.*, 2001) adopts the denomination “Anamorphic Fungi” instead. Furthermore, the *Dictionary* now provides for many anamorph genera references to associated teleomorph genera or orders, or, if unknown, simply to *Ascomycetes* or *Basidiomycetes*. A duplicate nomenclature for names of interconnected teleomorphs and anamorphs will gradually become superfluous and obsolete. Similarly, the permissible application of a dual or multiple nomenclature for distinct anamorphs in fungi, as apparently stimulated by Art. 59 up to the 1994 version of the ICBN (Hawksworth *et al.*, 1995), has demonstrated that this issue of Art. 59 (Gams, 1982; Buffin & Hennebert, 1984, 1985; Hennebert, 1991) is meaningless and this application is now discouraged by ICBN 2000 Recommendation 59A.3 (Greuter *et al.*, 2000; Kirk *et al.*, 2001)

Among several earlier authors, von Höhnelt (1923) suggested the integration of the conidial fungi into the classification of the higher fungi. Weresub & Pirozynski (1979) wrote: “The time will come when our grasp of the morphology, biochemistry and genetics of all fungi will enable us to classify all anamorphic fungi botanically.” Reynolds & Taylor (1991) considered the integration of all anamorphic fungi in the higher fungi inescapable. Hennebert (1993) suggested that somehow anamorph nomenclature will have to disappear and opined that we had to prepare ourselves to the move. But time was then not yet ripe to press on with official proposals. Reynolds (1994) advocated firmly for the deletion of Art. 59 and the merger of the asexual and sexual fungi into one system. Cannon & Kirk (2000) studied the philosophy and practicalities of amalgamating anamorph and teleomorph concepts and reiterated that “deletion of Art. 59 is inevitable in long term and it will be in the interest of nomenclatural stability to prepare for this event.” Hawksworth (*in litt.*, 19 March, 2001) took a lead with draft proposals for discussion to amend Art. 59 that may lead “to return to the one organism -- one name principle without plunging the nomenclature of pleomorphic fungi into chaos”. His proposals will also be analysed in the present contribution.

Some mycologists have advocated a whole-sale elimination of Art. 59, extending the Linnaean (botanical) unique nomenclature to all fungi. If then the priority rule is strictly applied, this will, however, greatly upset nomenclatural stability and have more undesirable than positive effects. A careful analysis

of the various components of Art. 59 is necessary in order to develop procedures that can lead to an integrated nomenclature applying one correct and legitimate name to each organism, with an evaluation of the destabilizing effects of such a move.

The *Code* introduces Art. 59 under consequently could the heading “Names of fungi with a pleomorphic life cycle”. Taken literally, this would apply only to the known pleomorphic fungi and anamorphic ones when found to be pleomorphic. Consequently, it would not apply to any other anamorphic fungi, both monoanamorphic and pleoanamorphic, which escape the effects of this rule and obey botanical holomorphic typification defined by Art. 7.2 (Fig. 1); this status would be lost as soon as they are connected to a named teleomorph. That strict interpretation limiting of the application of Art. 59 is confirmed in Arts. 1.3, 7.9, 25.1, 34 Note 1, and 51.1 of the present *Code*, all referring to Art. 59 as dealing with pleomorphic fungi.

Mycologists have been applying this article extensively -- possibly wrongly -- to all anamorphic fungi for more than a century, treating them as if all were potentially pleomorphic. So far we never paid enough attention to that chapter title of the *Code*, which restricted its application to pleomorphic fungi; we just followed the common practice of assimilating all anamorphic fungi to anamorphs of pleomorphic fungi; this was already initiated by Fuckel (1870) with the “Fungi Imperfecti”, and Saccardo with the “Fungi inferiores” (formae metageneticae Ascomycetum, Saccardo, 1889) or “Deuteromycetes” (Fungi secundarii, Saccardo, 1899) and ultimately led to segregating anamorph nomenclature from botanical nomenclature and restricting the concept of anamorph to a single asexual propagation structure rather than the entire vegetative and propagative “phase” of the fungus (Edinburgh ICBN: Lanjouw *et al.*, 1966; Sydney ICBN: Voss *et al.*, 1983). But if we bore in mind the restrictive application of Art. 59 and the fact that anamorphic fungi (those unconnected with a teleomorph) often are already holomorphic, i.e. that their holomorph does not comprise anything else than the observed anamorph pending proof of the contrary, we should apply the botanical system of nomenclature based on holomorphic application of types (Art. 7.2) to all non-pleomorphic, non-lichen-forming Ascomycota, Basidiomycota and deuteromycetes (Fig. 1). We are then already close to the procedures of integration 2 and 6 proposed here.

As just said, following the current treatment of the anamorphic fungi as if they were potentially pleomorphic and further considering with Mason (1937) and Hughes (1953) that anamorphs must be characterized by a unique asexual state or form, Hennebert (1971, 1987, 1991) and Hennebert & Weresub (1977) were convinced that the “conventional” or “anatomical” nomenclature of the anamorphic fungi required that all anamorph-species and genera be monomorphic, i.e. typified by a single apparatus of reproduction or propagation rather than by the “anamorphosis” (Donk, 1960) or the whole anamorphic “phase” of the fungus; Hennebert (1987) then coined the term “pleoanamorphic” to describe fungi with several anamorphic forms of propagation and receiving several names. The term “synanamorph” (Hughes, 1979) was then proposed for single correlated anamorphs. In the perspective of a desirable integration and elimination of all but one alternate names for pleoanamorphic fungi, a revision of the concept of “anamorph” used in Art. 59 for pleomorphic fungi as covering the whole “anamorphosis” rather than a single asexual form of propagation might be necessary. Such a revision would lead immediately to the acceptance of one name only for pleoanamorphic fungi. Procedures about how to choose that one name are outlined in this paper.

The aim of this paper is not to promote one way or another to proceed with the suppression of dual nomenclature and the integration of the deuteromycetes into the higher Fungi, but to define certain basic

rules that will help to eliminate dual nomenclature of non lichen-forming pleomorphic fungi and to integrate the deuteromycetes in the Asco- and Basidiomycota using botanical nomenclature. In this paper we also analyse different procedures in applying these rules so that nomenclature will be disrupted as little as possible. We hope that some of these rules will be supported by the mycological community.

1. Different kinds of typification of the fungi in the *Code*

The *Code* presently distinguishes **three kinds of typification** in fungi, depending on the taxon concerned:

1. Holomorphic typification (Chytridiomycota, Zygomycota, lichenized Ascomycota, Basidiomycota, and also Oomycota), defined by Art. 7.2 of the *Code*; this is the “botanical typification” characterizing the “botanical (Linnaean) system of nomenclature” (Hennebert, 1971). “The nomenclatural type is not necessarily the most typical or representative element of a taxon” (Art. 7.2). The type material is *freely* chosen, teleomorphic or anamorphic, as long as it represents the taxon, and the name is granted holomorphic application.
2. Teleomorphic typification based on the teleomorph with holomorphic application (non-lichenized Ascomycota and Basidiomycota), as defined in Art. 59.1, resembles botanical typification but mainly characterizes one part of the “anatomical system of nomenclature” (Hennebert, 1971).
3. Anamorphic typification based on an anamorph, with application restricted to the anamorph (asco-deuteromycetes and basidio-deuteromycetes and uncharacterized deuteromycetes) defined by Art. 59.3, characterizes the other part of the “anatomical system of nomenclature” (Hennebert, 1971).

In teleomorphic and anamorphic typification, the type material cannot be freely chosen but must *obligatorily* be either teleomorphic or anamorphic, with holomorphic or restricted anamorphic application, respectively. Therefore, different kinds of fungi require different kinds of typification. For different fungi, the application of the name will therefore depend on the morph present in its type.

As explicitly formulated in Art. 59.1 and 59.3 in ICBN (from the Sydney 1981 (Voss *et al.*, 1983) edition onwards, when the changes of Art. 59 proposed by L.K. Weresub were incorporated), non-pleomorphic anamorphic fungi typified by an anamorph cannot have holomorphic application and lose their status when found to be pleomorphic, subjected to Art. 59 according to its title. That formulation confirms the extended interpretation of Art. 59.

2. Different kinds of connection of anamorph genera with associated teleomorph genera

In the deuteromycetes, three kinds of genera can be distinguished, depending on the species included and their anamorph--teleomorph connection:

1. Genera of which all species are anamorphic, without recognized connection to a teleomorph.
2. Genera of anamorph species, some of which are connected to teleomorphs of one particular genus.
 - 2a. The same, one of the connected species ~~is~~ being the type species of the anamorph-genus.
 - 2b. The same, one of the connected species being the type species of the teleomorph-genus.
 - 2c. The same, one of the connected species being the type species of both genera.
3. Genera comprising anamorph species, some of which are connected to teleomorphs of different genera.
 - 3a. The same; one of the connected species is the type species of the anamorph genus.
 - 3b. The same, one of the connected species being the type species of its teleomorph-genus.

3c. The same, one of the connected species being the type species of its anamorph- and teleomorph-genera.

In addition, connections exist among anamorph species (synanamorphs) named in distinct anamorph genera. This and the resulting dual (or multiple) anamorph nomenclature may be correlated with one of the three cases described above.

Generic correlation: When in pleomorphic and pleoanamorphic fungi morphs are organically connected, the genera are said to be “*correlated*”. Genera, and therefore generic names, are said to be “*correlated*” when either they share the same fungus as type species, based on the same specimen (*Eupenicillium arvense* -- *Penicillium arvense*) or different specimens (*Hypocrea rufa* -- *Trichoderma viride*), or one or both have a type species that is a non-type species in the other genus (*Bionectria ochroleuca* -- *Clonostachys rosea*), or just -- what is most common -- share one or several pleomorphic species other than their type species. Correlated genera may also be considered as competing for precedence or protection (see 6.b below), as if botanically they were homotypic or heterotypic taxonomic synonyms. However, when none of their respective type species is a member of the other genus, although the genera share one or several pleomorphic species, the competition of such generic names may be questioned and the genera may rather be considered independent.

Synonymy: Under the present Art. 59, anamorph-generic names of pleomorphic fungi cannot be true synonyms of correlated teleomorph-generic names, but they remain anamorphic synonyms and are always available for unconnected anamorphic species. Depending on the chosen procedure (as proposed below), when precedence is applied among correlated generic names, anamorph-generic names will keep the same restricted anamorphic status as under the present Art. 59, unless selected for precedence.

3. Conventions and definitions

The terms anamorph and teleomorph have been defined as anatomical parts, asexual and sexual respectively, of the fungal organism (the holomorph in all its potentialities) which may deserve a name under Art. 59 (Hennebert & Weresub, 1977; Hennebert, 1993). Correlated anamorphs or synanamorphs are mutually-connected anamorphs (Hughes, 1979). The terms anamorph and teleomorph are merely descriptive nomenclatural and not karyological terms (Weresub & Hennebert, 1979; Korf & Hennebert, 1993) although the terms mitosporic and meiosporic have been advocated to substitute them (Reynolds & Taylor, 1993) and supported by Hawksworth & Mouchacca (1994) and Hawksworth *et al.* (1995).

Under the anatomical nomenclature ruled by Art. 59, an “anamorph name” (name of an anamorph) is a name typified by an anamorph (in brief: “**ana-typified**”) and assigned a restricted anamorphic application under Art. 59.3. A “teleomorph name” is a name typified by a teleomorph (in brief: “**teleo-typified**”) and assigned holomorphic application under Art. 59.1.

It is noteworthy that Art. 59.3 does not use the term “monoanamorphic” nor “pleoanamorphic” nor the term “synanamorph” in the sense of Hughes (1979), but simply uses the term “anamorphic”. From this observation, Hennebert (1971) supposed that two interpretations existed of the term “anamorphic”, one applying it to a single structure of so-called “asexual” reproduction or propagation (equivalent to “monoanamorphic”), the other applying it to the whole asexual phase of the fungus (equivalent to “polyanamorphic” or “synanamorphic” in the sense of Gams (1982). This second interpretation, though it is not the current one of Art. 59, is presumably correct.

A holomorphic type (not holotype, a term with a different meaning), which may consist of any representative part of a fungus, is necessarily of holomorphic application as inherent to botanical (Linnaean) nomenclature (Art. 7).

Considering a possible deletion of Art. 59, an ana-typified name or epithet, so far of restricted anamorphic application under Art. 59, may become assigned holomorphic application, retroactively or not. For that reason, we use the term “ana-typified name” to simply designate the nature of the type in the integration procedures described below, and *not* its application. An ana-typified name or epithet would become an ana-typified holomorph name or epithet when assigned holomorphic application after deletion of Art. 59.3, just like in botanical nomenclature under Art.7.2 (e.g. for *Mucor* spp.) and like teleo-typified names under the present Art. 59.1. The type of such a fungus is then also holomorphic by application and the name or epithet no longer is an “anamorph name” or “anamorph epithet”. We note that the distinction of different kinds of types and of different applications is already hidden in the present Art. 59 of the *Code*, assigning holomorphic application to teleomorphic types and anamorphic application to anamorphic types whereas both kinds of type should be assigned holomorphic application according to Art. 7.2.

When a fungus bearing an ana-typified name is found to be sexual, it might be desirable to confirm the holomorphic application of its name for practical reasons and designate a teleomorphic epitype besides the anamorphic type. An epitype is indeed “a specimen or illustration selected to serve as an interpretative type when the holotype, lectotype, or previously designated neotype, or all original material associated with a validly published name, is demonstrably ambiguous and cannot be critically identified for purposes of the precise application of the name of a taxon” (Art. 9.7).

We also use the short terms **ana-connection** for an anamorph--anamorph or synanamorph connection and **teleo-connection** for an anamorph--teleomorph connection. *Texts concerned with synanamorph or pleoanamorphic nomenclature, which are considered here in equal detail but possibly need not be ruled formally, are italicized throughout this text.*

The “**correct name**” is the binomial that must be selected according to the rules of each Procedure.

Cross-reference designation is the general term for expressions like “*Alternaria* state (or anamorph) of *Lewia infectoria*” or “*Echinobotryum* synanamorph of *Cephalotrichum stemonitis*” used for the informal designation of an anamorph of pleomorphic and pleoanamorphic fungi. Other forms of cross-reference designation are using either the approached form-generic name (*Botrytis*-like anam. of *Sclerotinia spermophila*) or the same in a decapitalized form as a descriptive term “*acremonium* anamorph of ...”, “*acremonium*-like anamorph of ...” (Seifert & Samuels, 2000; Cannon & Kirk, 2000; Rossman, 2000), or solely common terms like “anamorph” or “conidial state of ...”.

Cross-reference designation in the format “<anamorph genus> state of <correct name>” has been proposed long time ago. Already Tulasne & Tulasne (1851) proposed the “*Cytospora* state of *Valsa ambiens*”. Then Mason (1937), Hughes (1958), Hennebert (1967, 1971), Ellis (1971, 1976), and Carmichael (1979) used similar formulations. All these authors advocated the necessity to allow strict application of the principle of nomenclature “one organism--one name” for both pleomorphic and pleoanamorphic fungi.

The abbreviation “**D**” is used for a date to be determined at which the proposed changes will become effective.

4. The three goals of integration

Dual nomenclature and, consequently, the separate classifications of all non lichen-forming Ascomycetes and Basidiomycetes as opposed to deuteromycetes, result from the existence of alternative names permitted by Art. 59 for pleomorphic species, and from the extension of the same Article to any other taxa of those fungi, as if they were potentially pleomorphic. This extended application of Art. 59 also led among anamorphic fungi to the distinction of pleoanamorphic from monoanamorphic taxa.

Integration therefore implies three goals:

- (1) removal of dual nomenclature for pleomorphic fungi,
- (2) unification of the nomenclatural system for all fungi, and
- (3) unification of the classificatory scheme.

5. THE FIRST GOAL: How to rule undesirable names in pleomorphic fungi

In the deliberations concerning names affected by Article 59 when strictly applied, we need clear concepts about the availability of names. When choosing among two or more correlated names, one name will receive preference over the other(s). What qualification is to be assigned to those names that will have to be suppressed or eliminated?

5.a. Existing mechanisms of the *Code* to refute names

The *Code* foresees different options to exclude certain names from use or from recognition as correct when they do not obey the rules, disrupt nomenclatural stability, compete with priorable sanctioned or conserved names, or are earlier homonyms of sanctioned or conserved names; a further mechanism restricts the application of alternate anamorphic names in pleomorphic fungi.

A first option, **priority**, determines the choice amongst synonyms, but only if the competing names have holomorphic application.

A second option is the elimination of **illegitimate** names. *Legitimate* names, according to Art. 6.5, are in accordance with the rules; *illegitimate* names are published names conflicting with the rules. Art. 6.4 specifically mentions certain cases:

- illegitimate is a name of family or subdivision of family based on an illegitimate generic name (Art. 18.3, 19.5).
- illegitimate is a *nomenclaturally superfluous* name, i.e. the name of the taxon that, as circumscribed by its author, definitely includes the type of another name which ought to have been adopted (Art. 52.1), with the exception of names based on a legitimate name, which remains legitimate but is incorrect (Art. 52.3).
- illegitimate are *later homonyms* spelled like an earlier name in the same rank based on a different type (Art. 53).

An *illegitimate* name cannot become legitimate later unless conserved or sanctioned (Arts. 6.4, 15.1). It is therefore illegitimate *for ever* and must be *rejected*.

A third option is **explicit rejection** of certain legitimate names (Art. 56.1) to avoid detrimental nomenclatural changes (see Art. 14.1). The rejected names are entered in a list of *Nomina rejicienda* (Appendix III A and B (for Art. 14) and IV (for Art. 56)). Explicit rejection of names is not reversible.

A fourth option is the suppression of priorable names in favour of sanctioned names or of conserved

names of well-known synonyms or homonyms. A *conserved* name is then declared legitimate, even if it was initially illegitimate. It is conserved against all other names that are listed as homotypic and heterotypic synonyms and all combinations thereof and against earlier homonyms (Art. 14.4), which are rejected. A *sanctioned* names of fungi (Art. 13.1d) is as if conserved against competing older synonyms and earlier homonyms (Art. 15.1). Listed synonyms of conserved names are declared illegitimate, rejected and not restorable (Art. 14.7). The rejected heterotypic synonyms can be restored to legitimacy and used if the synonymy with the taxon bearing the conserved names is refuted (Art. 14.6), e.g. *Cyphella* listed in App.IIIA under *Aleurodiscus*.

Earlier homonyms of conserved or sanctioned names are *not* made illegitimate but are just *unavailable for use* and can be *restored* as a recombination in a non-homonymous binomial (Art. 14.10, 15.2). They are what we call “**repressed**”, according to the new concept developed below in this paper. The term “repressed” is not used in the *Code* nor its opposite, “protected”. This is very similar to the repression in our proposed mechanism of **protection/repression**.

Precedence: Under the present Art. 59, alternate names of pleomorphic fungi are not rejected but their publication and use are permitted besides the teleo-typified holomorph names. Teleo-typified names are assigned holomorphic application and given “**precedence**” (Art. 59.4), irrespective of priority, over prior or later alternate names, which, however, retain legitimacy and remain available for use. The opposite of precedence is **restricted applicability**.

5.b. New concepts to rule undesirable names in pleomorphic fungi

In order to eliminate dual nomenclature in pleomorphic fungi, different concepts are required.

In some procedures proposed below, ana-typified names, epithets and generic names, just like teleo-typified names, are attributed holomorphic application, allowing the full play of priority in favour of the earliest name and of synonymy. If priority is not the decisive principle, rules are needed to prevent priority of undesired names, e.g. an earlier, teleo-connected, ana-typified name competing with a later teleo-typified name.

It would be possible to declare earlier ana-typified and teleo-connected names to be illegitimate and rejected in order to avoid nomenclatural disturbance according to Art. 56.1, or to declare the teleomorph names conserved or sanctioned. A more appropriate solution is to declare the competing ana-typified names “**repressed**” in order to attribute “**protection**” to the teleomorph names. The respective ana-typified names are then unavailable for use, but remain legitimate and restorable should the reason for “*repression*” disappear, i.e. the organic connection anamorph – teleomorph be refuted.

It does not appear appropriate to declare teleo-connected, ana-typified names illegitimate and rejected in order to avoid nomenclatural disturbance or associated teleomorph names conserved or sanctioned for the following reasons:

- Rejected names are rejected for ever. Conserved or sanctioned names are so for ever.
- Illegitimacy and rejection are incompatible with the status of names that should be repressed, keep their legitimacy and remain restorable. When the connection between the morphs is found erroneous, repressed names must recover availability, the protected name must lose its protection and eventually be replaced by another correct protected name.
- Conservation or sanctioning cannot confer a reversible protection either for the same reason. While

conserved names are conserved for ever, their rejected heterotypic synonyms can be restored to legitimacy and used when the synonymy is refuted. This particular case can resemble the proposed protection/repression of alternate names. The differences appear to be in that conservation is definitive and protection is not, that repressed alternate names keep legitimacy and that the “biological” or “organic” connection/synonymy is not of the same nature as taxonomic heterotypic synonymy.

Repression of alternate names may appear objectionable according to Art. 51.1 of the present *Code* which stipulates that “a legitimate name must not be rejected merely because another is preferable or better known.” In this article, rejection means elimination for ever, while repression means unavailability as long as the organic connection between correlated taxa can be upheld.

The concept of “*protection*” of certain names against others that are “*repressed*” and *unavailable for use* but legitimate and restorable, seems appropriate. It will be adopted in the Procedures described below, at least at the level of epithets. The concept of “*precedence*” of certain names over others that are superseded as “*restricted in application*” though still legitimate and available for use, may also be appropriate to retain ana-typified generic names available.

To reduce the necessary name changes to a minimum, automatic protection may be chosen for teleo-typified names published prior to D (the date of application of new rules) against any associated ana-typified name, but it might be useful to retain certain ana-typified names for some very representative or commonly used taxa as exceptions.

5.c. Three mechanisms leading to a unique nomenclature in pleomorphic fungi

The straightforward application of **priority (mechanism 1)** for the existing names of pleomorphic fungi would lead to nomenclatural “chaos” (Hawksworth 2001). Frequently anamorph epithets and generic names have been coined prior to teleomorph epithets and generic names. Although this usually is not the case in all pleomorphic species of a genus or for all anamorph genera, a number of new combinations in all directions would be necessary. The absence of strict correspondence between anamorphic and teleomorphic genera, and the non-pleomorphic anamorph species without known teleomorph affinities, would require a number of new generic names if their anamorph generic name is not priorable. Of course, current revisions of heterogeneous anamorph genera already tend to divide them into a number of new genera. To evaluate how great the ensuing “chaos” would be, a complete inventory of the pleomorphic fungi must first be made. However, priority *is* the mechanism to be applied to new names or existing names of new connections of pleomorphic fungi in any forthcoming botanical system from D onward.

For names coined before D we propose to use the mechanism of **protection/repression (mechanism 2)** applied to *both* epithets and generic names against the otherwise prevailing priority rule, when choosing amongst competing names for pleomorphic and pleoanamorphic species and genera. If this mechanism is applied, new generic names would have to be introduced for purely anamorphic species without definite affinities, if the original anamorph-generic name lost its status by repression.

However, if it is desirable, besides **protection/repression of epithets**, to retain competing ana-typified generic names, which otherwise are repressed, available for classifying purely anamorphic species, **precedence/restriction** can be applied in favour of the **generic names** correlated to teleomorphs

before D or eventually of those to come from D onward (**mechanism 3**). Among correlated (syn)anamorph-generic names, precedence/restriction should also be applied.

To warrant a certain nomenclatural stability, these three mechanisms can be applied with two options: **Option A** in mechanism 2 automatically protects all teleo-typified epithets and generic names. In mechanism 3, it automatically protects teleo-typified epithets only and gives precedence to all teleo-typified generic names (names with holomorphic application) without exception. If mechanism 1 is chosen, priority would have full play. **Option B** permits **selected exceptions**: In mechanism 2, well-known and commonly used ana-typified epithets and generic names may be protected with holomorphic application, and the less used teleo-typified epithets and generic names are repressed. Under mechanism 3, ana-typified generic names must be declared protected with holomorphic application instead of having precedence, against the correlated teleo-typified generic name that is then repressed and not restricted in application; otherwise their names would compete as holomorphic. The selected exceptions (option B) in favour of teleo-connected anamorphic names are thus treated similarly in mechanisms 2 and 3. Exceptions will have to be approved and listed. If priority (mechanism 1) were chosen, exceptions could still be treated by invoking conservation.

As an example, the ana-typified generic name *Botrytis* Pers. with the type species *Botrytis cinerea* (teleom. *Botryotinia fuckeliana*) versus the teleo-typified generic name *Botryotinia* Whetzel (type species *B. convoluta*). Presently in mechanism 2, option A, the epithet *fuckeliana* is protected and *cinerea* repressed, the generic name *Botryotinia* is protected and *Botrytis* is repressed. In mechanism 3, option A, *Botryotinia* takes precedence and *Botrytis* is restricted to anamorphic species. The correct name is *Botryotinia fuckeliana*. In mechanism 2 and 3 similarly, option B, if selected as exception, *cinerea* is protected against *fuckeliana* and *Botrytis* protected against the repressed *Botryotinia*. The name will be *Botrytis cinerea* with holomorphic application. The genus *Botrytis* with holomorphic application will then accommodate both teleo- and ana-typified species, including the type species of *Botryotinia*, as *Botrytis convoluta*; *Botryotinia* is then repressed. Thus, in Option B, the mechanism of precedence/restriction normally applies to teleomorph/anamorph but it cannot be reversed and applied to anamorph/teleomorph in selected exceptions. The mechanism of precedence/restriction will be applied between synanamorph-generic names.

Three mechanisms can thus be applied to achieve a unique nomenclature in pleomorphic fungi:

1. The rule of priority is not to be applied retroactively to existing names of pleomorphic fungi published prior to D, but to new names or new connections of existing names published after D and to any other names of non-pleomorphic fungi. This requires an extension of the type application of ana-typified names of pleomorphic fungi and names of non-pleomorphic anamorphic fungi from anamorphic to holomorphic to warrant synonymy after D (see Goal 2).

2A. Automatic protection applies to both teleo-typified epithets and correlated generic names and connected ana-typified epithets and generic names are repressed. -- 2B. The same as 2A but with selected exceptions that attribute protection to ana-typified epithets and generic names and repress the connected teleo-typified epithets and generic names.

3A. Automatic protection applies to teleo-typified epithets and precedence to teleo-typified generic names; it represses connected ana-typified names and leaves connected teleo-typified generic names available also for still anamorphic fungi. -- 3B. The same as 3A, but with selected exceptions that attribute protection to ana-typified epithets and generic names and repress the connected teleo-typified

epithets and generic names, as in 2 B. Precedence/restriction is not applicable in favour of ana-typified generic names, as explained above.

The application of these mechanisms combined with different treatments of the non-pleomorphic anamorphic fungi under Goal 2 (below) leads to a number of procedures in handling pleomorphic and non-pleomorphic fungi published before and after D. Six of them are described below. Exceptions possible under option B of each mechanism are considered in principle but not in detail, requiring case-by-case decisions.

In pleoanamorphic fungi, when names of correlated anamorphs compete, a mechanism of protection/repression is also needed to decide which of several synanamorph names is to be applied for a fungus. The choice for protection can be directed either to a) the most commonly used one, or b) the most representative one, if not the earliest name (Gams, 1982). In the present concept, names for correlated anamorphs are not true synonyms but anamorphic synonyms. If we consider the concept of anamorph used in the Code as representing the whole “anamorphosis” of the fungus, the names of correlated anamorphs are true synonyms.

Between correlated anamorph genera, the mechanism of precedence/restriction is to be applied and not protection/repression.

Remaining in the given example, *Botrytis* is also correlated with the older genus *Sclerotium* Tode; the *Sclerotium* anamorph of *Botrytis cinerea* was described as *Sclerotium durum*. If precedence is given to *Botrytis*, *Sclerotium* would remain available in the restricted sense of sclerotia. In the present case, these genera are not really competing because they do not share the same type species; the type species of *Sclerotium* is in fact a basidiomycete (Donk, 1962).

5d. Prerequisite: To evaluate the value of each of the three mechanisms and the possible exceptions for the greatest nomenclatural stability while removing dual nomenclature, we need a full database of the pleomorphic, pleoanamorphic and non-pleomorphic species and their genera.

6. THE SECOND GOAL: Integration of the distinct nomenclature of the anamorphic fungi (deuteromycetes). Possible principles and procedures

The second goal of integration concerns *all* non-lichen-forming Ascomycota, Basidiomycota, and deuteromycetes.

The problems inherent to the separate nomenclature of Ascomycetes, Basidiomycetes and deuteromycetes and the dual nomenclature of pleomorphic species have their origin in anatomical (teleomorphic and anamorphic) typification (Hennebert, 1971) of the higher fungi and its extension to all non-pleomorphic anamorphic fungi. In botanical (Linnaean) taxonomy, species simply exist; their name is fixed by a type specimen which need not show all possible phenotypes or organs; it *must* just be representative of the organism. The present ruling for higher fungi that a type specimen must show features of the teleomorph or, else, it can only document an anamorph, is in obvious conflict with this philosophy.

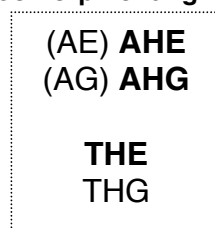
This results from the evolution of Art. 59 (first numbered 49 bis, then 57, then 69), at first limited to the pleomorphic fungi but later extended to all non-pleomorphic fungi, ultimately segregating two lines of nomenclature. This is represented schematically in Fig. 1.

Any proposed reduction and integration of the two lines of nomenclature must envisage a decision

to change typification from anatomical (anamorphic) to botanical (holomorphic) application, not only in pleomorphic fungi but also in other non-pleomorphic anamorphic fungi. All deuteromycetes should indeed be integrated in the Ascomycota and Basidiomycota and their nomenclature united.

Change of type application in deuteromycetes

A. Art. 59-strictly applied to Pleomorphic fungi only



B. Art. 59-extended to Anamorphic fungi

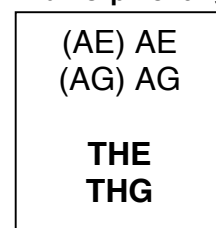


Fig. 1. Symbolic representation of the situation governed by Art. 59. A. Interpretation in the strict sense according to subtitle, B. interpreted as presently extended to all anamorphic fungi. **Abbreviations** used: E for epithets: AE = restrictedly anamorphic epithets of anamorphic fungi, (AE) = permitted restrictedly anamorphic epithets of pleomorphic fungi, AHE = ana-typified epithets with holomorphic application, THE = teleo-typified epithets with holomorphic application. G for generic names: AG = restrictedly anamorphic generic names of anamorphic fungi, (AG) = permitted restrictedly anamorphic anamorph-generic names of pleomorphic fungi, AHG = ana-typified generic names with holomorphic application, THG = teleo-typified generic names with holomorphic application.

In order to achieve a botanical system of nomenclature for all fungi as far as possible, holomorphic application can be assigned to all or part of the types of ana-typified epithets and/or generic names. Five different levels of extension are possible, either at generic rank or at specific and generic ranks, and only until a certain date D, or until and after date D. These levels of extension of holomorphic type application, schematically represented in Fig. 2, will serve in describing the main differences between the six proposed procedures as outlined here.

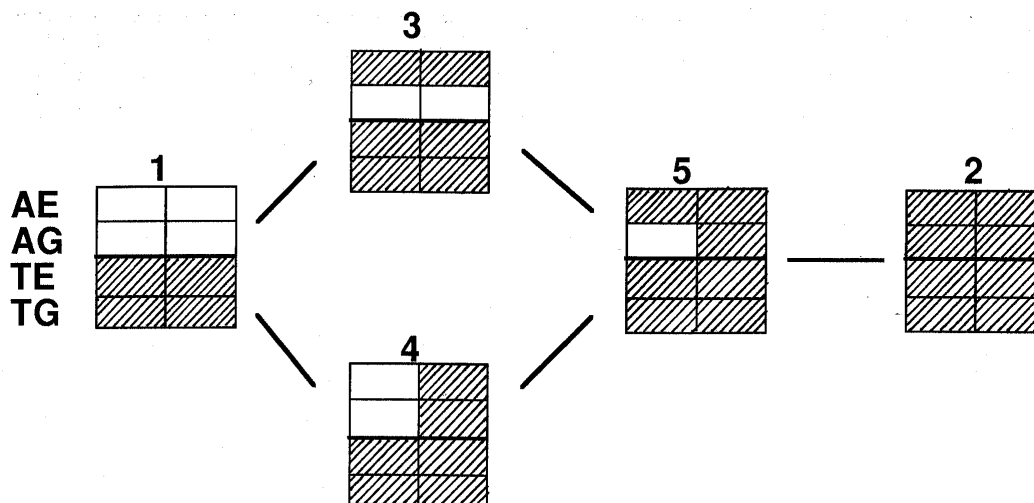


Fig. 2. The five levels of extension of holomorphic application to ana-typified epithets and generic names (AE and AG), TE and TG standing for teleo-typified epithets and generic names. The central vertical lines represent the date D on a horizontal time axis at which integration is enacted. White blocks represent anamorphic application of names, hatched blocks holomorphic application.

Level 1 retains the anatomical, restrictedly anamorphic typification of the epithets and generic names of anamorphic fungi, as presently ruled by Art. 59, and does not allow their integration in the botanical system. On the contrary, level 2, extending holomorphic application of names to ana-typified epithets and generic names retroactively, makes their integration possible. Levels 3 to 5 entail partial extension and maintain either anamorphic application of ana-typified epithets and generic names, under Art. 59, until the date D (level 4), of all present and future ana-typified generic names (level 3) or only of those existing before D (level 5). It is clear that the levels 3, 4 or 5 of extension retain the anatomical typification of names of some taxa, while the names of other existing and future taxa will be botanically typified. By still mixing two systems of nomenclature, they are not better than the present situation (level 1) and do not achieve a real integration.

7. The six procedures of integration in relation to the first two goals

In conceiving possible procedures of integration, we expect

- to suppress a separate nomenclature of pleomorphic and pleoanamorphic fungi (Goal 1),
- to preserve present nomenclature of the Ascomycota and Basidiomycota as far as possible or desirable,
- to integrate the classification and nomenclature of non-pleomorphic anamorphic fungi in that of the Ascomycota and Basidiomycota (Goal 2), and
- to apply simple and coherent sets of rules.

Combinations of mechanisms for the elimination of alternate names of pleomorphic fungi and the extension of holomorphic application of anamorphic names are the basis of possible procedures of integration of the higher fungi into a botanical system.

Priority (mechanism 1) is only operational among competing names which are declared of holomorphic application, thus in level 2 and after D in levels 3-5. It cannot be considered for retroactive application to pleomorphic fungi, because of ensuing nomenclatural chaos that would result.

Protection/repression (mechanism 2), of both epithets and generic names of pleomorphic fungi, can be applied to any of the five levels of extension of holomorphic application, leading to five possible procedures of which only one based on level 2 is considered (Procedure 2).

The bipartite mechanism, protection/repression of epithets and precedence/restriction of generic names (mechanism 3), which can save anamorph-generic names, can be combined with any of the five levels of extension of holomorphic application and result in five procedures (Procedures 1 and 3-5).

Among the eleven possible procedures, six have been selected that may cause least nomenclatural disruption. They are illustrated (Fig. 3) under option A, but option B is also considered in the descriptions.

Procedures 1 (level 1 and mechanism 3A) and 2 (level 5 and mechanism 2A) represent the two extreme positions: Procedure 1 maintains for ever the anatomical typification ruled by Art. 59 for anamorphic species and genera, but prevents dual nomenclature of pleomorphic fungi at the rank of species only by repressing ana-typified epithets (symbol (-) instead of (AE)). Procedure 2 retroactively suppresses anatomical typification, converted into holomorphic typification, and consequently dual nomenclature, at both ranks of species and genera, by repressing existing ana-typified epithets and generic names, while after D priority is in full play. Procedure 6 (level 2 and mechanism 3A), like Procedure 2, retroactively suppresses the anatomical typification, and, like Procedure 1, removes dual nomenclature at the rank of species only.

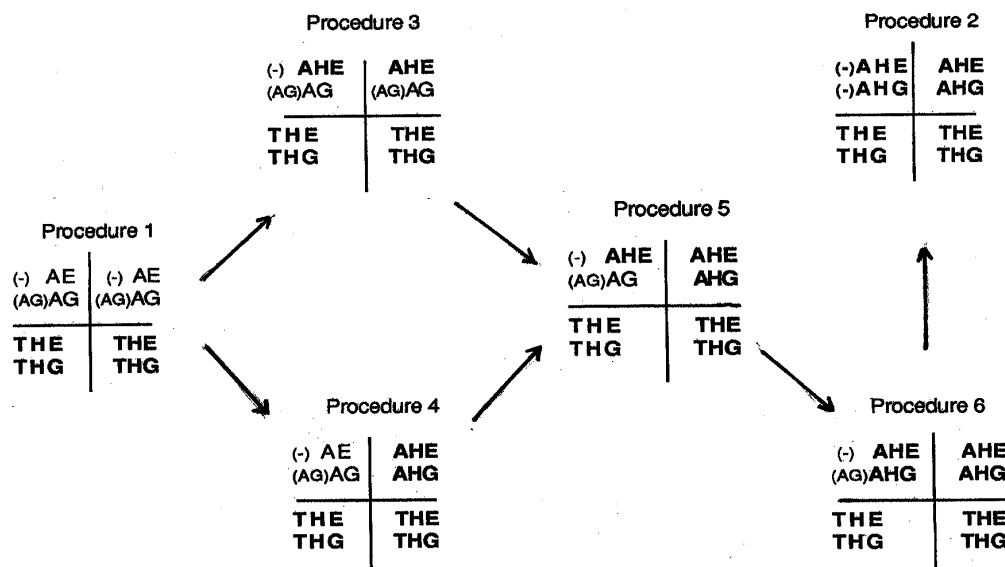


Fig. 3. Application of names in the six Procedures of integration. Anamorphic application normal print, holomorphic application bold. The vertical line separates the situation before and after D. The horizontal line separates ana-typified and teleo-typified names. Each procedure is represented in option A. A parenthetic dash (-) indicates repressed anamorph epithets of pleomorphic fungi in all procedures, and repressed anamorph-generic names of pleomorphic fungi in Procedure 2. Application of protection/repression to epithets and precedence/restriction to generic names eliminates alternate names of pleomorphic fungi in all procedures except Procedure 2 where anamorph-generic names are repressed. Names of non-pleomorphic fungi are treated differently, depending on the extension of holomorphic application in each procedure.

Procedures 3--5 are intermediates. Procedure 3 (level 3 and mechanism 3A) suppresses anatomical typification of epithets retroactively but retains the anatomical typification of anamorph-generic names for ever. Procedure 4 (level 4 and mechanism 3A) perpetuates anatomical typification of all anamorph-

generic names and epithets published before D but suppresses anatomical typification of all names at all ranks published after D. Procedure 5 (level 5 and mechanism 3A) retroactively suppresses anatomical typification of ana-typified epithets and generic names except for anamorph-generic names published before D. Procedure 4, or perhaps Procedure 5, most strongly resembles Hawksworth's (2001) proposal. Nevertheless, these three intermediate procedures are most complex and not recommendable.

Both Procedures 2 and 6 achieve the removal of dual nomenclature of pleomorphic fungi and the integration of the anamorphic fungi into a unique botanical system of the Fungi, except that Procedure 6 maintains correlated ana-typified generic names of pleomorphic fungi published before D in restrictedly anamorphic use, while ana-typified generic names published after D are holomorphic. That might seem to favour nomenclatural stability but it places ana-typified generic names in two different status: those with anamorphic, and those with holomorphic application. In contrast, in Procedure 2, using mechanism 2A, ana-typified generic names are repressed, their anamorphic species are integrated in the correlated teleo-typified genera, and all remaining ana-typified generic names are holomorphic. Under mechanism 2B, some exceptionally protected ana-typified generic name would also be holomorphic.

Example: *Botrytis cinerea* anam. of *Botryotinia fuckeliana* and the anamorphic species *Botrytis aclada*.

In Procedure 1 *cinerea* is repressed. *Botryotinia fuckeliana* is the sole name (by protection of the epithet and precedence of the generic name). *Botrytis* is restricted to anamorphic application. The ana-typified *B. aclada* remains in *Botrytis*. If *B. aclada* becomes teleo-connected, *aclada* (anamorphic) will be repressed and replaced by a new epithet in *Botryotinia*.

In Procedure 6 the same as above, but if *B. aclada* becomes teleo-connected, *aclada* (holomorphic) can be combined in *Botryotinia*.

In Procedure 2 *Botrytis* and *cinerea* are repressed. *Botryotinia fuckeliana* is the sole name (by protection). The ana-typified *Botrytis aclada*, when teleo-connected, is transferred as *Botryotinia aclada*.

8. THE THIRD GOAL: Integration of the classifications

The third goal is the integration of the deuteromycetous taxa in the classification of the Ascomycota and Basidiomycota. In view of the integration it is an urgent task to determine the affinities of the anamorphic fungi to teleomorphic fungi.

Deuteromycetes must at least be characterized, on the basis of taxonomic, morphological, chemical or molecular criteria, as pertaining to either the Ascomycota or the Basidiomycota. Subclasses or classes like Ascocodeuteromycetidae or Basidiodeuteromycetidae (Luttrell, 1979) or Ascocodeuteromycetes or Basidiodeuteromycetes (Hennebert, 1993), or informal groups, like anamorphic Ascomycota/Basidiomycota, might be proposed to accommodate the still uncorrelated deuteromycetous genera. It is, however, preferable to associate them, when possible, with taxa classified in genera, families and orders of the Ascomycota or Basidiomycota, as it is done in the 9th edition of the *Dictionary of Fungi* (e.g. *Uredo* besides *Puccinia* and *Uromyces* in the *Pucciniales*).

NOTE. Formal proposals emending Art. 7.2, 7.9, 11.1 and 59 are formulated for each Procedure described here. They do not include the necessary adaptations of other Articles of the *Code* referring to Art. 59, such as Arts. 1.3, 7 Note 1, 13.6, 25.1, 34 Note 1, and 51.1.

Synopsis of the application of protection/repression and precedence/restriction and of the application of types

Procedure 1A		Before D		After D	
	Teleo-typified	Ana-typified	Teleo-typified	Ana-typified	
Epithets	H protected H ---	A repressed --- A	H protected H ---	A repressed --- A	
Generic names	H precedence H ---	A restricted --- A	H precedence H ---	A restricted --- A	

Procedure 2A		Before D		After D	
	Teleo-typified	Ana-typified	Teleo-typified	Ana-typified	
Epithets	H protected H ---	repressed --- H	H H ---	or H --- H	
Generic names	H protected H ---	repressed --- H	H H ---	or H --- H	

Procedure 3A		Before D		After D	
	Teleo-typified	Ana-typified	Teleo-typified	Ana-typified	
Epithets	H protected H ---	repressed --- H	H H ---	or H --- H	
Generic names	H precedence H ---	A restricted --- A	H precedence H ---	A restricted --- A	

Procedure 4A		Before D		After D	
	Teleo-typified	Ana-typified	Teleo-typified	Ana-typified	
Epithets	H protected H ---	repressed --- A	H H ---	or H --- H	
Generic names	H precedence H ---	A restricted --- A	H H ---	or H --- H	

Procedure 5A		Before D		After D	
	Teleo-typified	Ana-typified	Teleo-typified	Ana-typified	
Epithets	H protected H ---	repressed --- H	H H ---	or H --- H	
Generic names	H precedence H ---	A restricted --- A	H H ---	or H --- H	

Procedure 6A		Before D		After D	
	Teleo-typified	Ana-typified	Teleo-typified	Ana-typified	
Epithets	H protected H ---	repressed --- H	H H ---	or H --- H	
Generic names	H precedence H ---	A restricted --- H	H H ---	or H --- H	

Fig. 4. Diagrams illustrating the function of the six Procedures (each in option A). Epithets and generic names (abbreviations as in Fig. 1 and 3) are disposed along the horizontal time axis according to the time of their publication; the vertical line represents date D. Continuous horizontal lines show holomorphic, broken lines anamorphic application of names. Bridges indicate the time of establishment of anamorph--teleomorph connections, arrows point to the correct epithet or generic name. Different bridges indicate the kind and the direction of the applied

rule: protection/repression (double lines), precedence/restriction (broken lines), priority (simple lines).

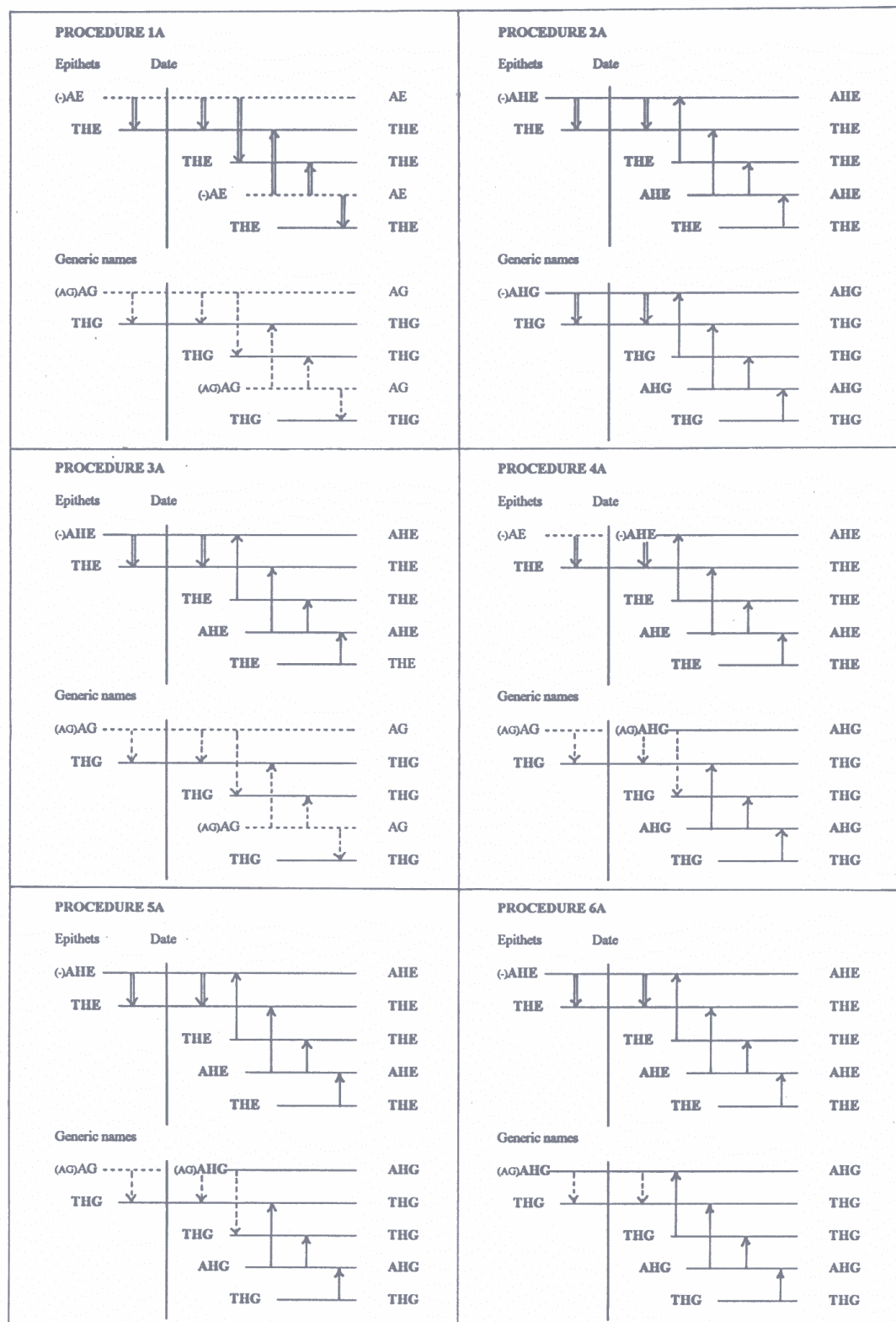


Fig. 5. Synopsis of the application of protection/repression and precedence/restriction and of the holomorphic (H) and anamorphic (A) application of the types in option A of the 6 procedures of integration. In option B, the mechanisms can also be reversed: “repressed/protected” together with “protected/repressed” and “repressed/protected” together with “precedence/restricted application”. The three lines in each box represent three cases:

1st line: pleomorphic taxa (i.e. ana--teleo-connected);

2nd line: teleomorphic taxa (“---” meaning absence of an anamorph name);

3rd line: anamorphic taxa (“---” meaning absence of a teleomorph name).

PROCEDURE 1

Principle: No changes in the existing anatomical typification for the past and the future, except that alternate names for teleomorphic fungi will no longer be permitted. Anamorph epithets and generic names retain their restricted anamorphic application.

The integration is nothing more than just disposing (mixing, interspersing) anamorph taxa in the teleomorph-based classification that becomes a unified classification. The deuteromycetes are classified among the respective Asco- or Basidiomycota. The nomenclatures of teleomorphic and anamorphic fungi continue to coexist but are interspersed in a unified classification with one name for each fungus in either teleomorph- or anamorph-generic combinations. The use of multiple names in pleomorphic and pleoanamorphic fungi is prevented by protection/repression. This integration is mostly a taxonomic and classificatory procedure. Art. 59 is basically maintained, but Art. 59.5 is replaced by a refinement.

Use of separate binomials for the same fungus is prevented by a new Art. 59.4, which assigns automatic protection and precedence to names typified by the teleomorph in pleomorphic fungi (Procedure 1A). Such a system will not be appreciated by most practitioners who are commonly using alternate names, which will be repressed; they are either older or most representative (the anamorph being most differentiated) and most frequently used. Therefore we propose a mechanism of selective protection and precedence (Procedure 1B), which allows exceptions to the automatic precedence of teleomorphic names, some anamorphic epithets and generic names being possibly selected for protection and/or precedence.

Anamorphs of teleo-connected or ana-connected species are indicated by their correct name or in cross-reference form.

NEW RULES SHOULD DECLARE

PROCEDURE 1A (Figs. 3, 4, 5)

(1) Repressed and unavailable for use: **anamorph epithets** published *before* or *after* *D* of teleo-connected species and infraspecific taxa. The repressed epithets remain legitimate but can be restored if the ana-teleo connection is demonstrated erroneous. They are anamorphic synonyms of the correct name of the holomorph and should be cited as *nomen repressum* (in brief "*nom. repr.*"). Teleo-typified epithets and binomials published before or after *D* are protected against connected anamorph epithets. Binomials of teleomorphs are indeed the sole correct names of the holomorphs (Art. 59.1-2).

Art. 59.5, Art. 59.5 Note 1 and Art. 59.A3 are deleted. A new Art. 59.4 is proposed to prevent the use of anamorph binomials besides the teleomorph binomial or another anamorph binomial for the same fungus.

The combination of an anamorph epithet and a teleomorph-generic name remains ruled by Art. 59.6.

(2) Accepted and available for use: **anamorph epithets** published *before* or *after* *D* of anamorphic species or infraspecific taxa as long as they are *not connected* to a teleomorph (Art. 59.3).

- (3) Having precedence: **teleo-typified generic names** published *before* or *after D* by holomorphic application of their teleomorphic type (Art. 59.1-2) over correlated anamorph-generic names.
- (4) Accepted and available for use: any **anamorph-generic names** published *before* or *after D* and restricted in application by virtue of their anamorphic type, even if they are correlated to a teleo-typified generic name by their type or another teleo-connected species whose anamorph name will then be repressed; they do not compete with the generic name of the holomorph. When superseded, they are not true but anamorphic synonyms of the correlated teleomorph-generic names, but they remain legitimate and are available for unconnected anamorphic species.

The teleomorph name of the species is to be used for the formal designation of the teleo-connected type or other such species of a correlated anamorph-generic name. The anamorph of a named teleomorph species can informally be addressed in cross-reference form.

This is to be formulated in the new Art. 59.5.

- (5) *Protected and available for use: a single **anamorph epithet of pleoanamorphic fungi** that is selected as either the most commonly used, or the most representative, if not the earliest legitimate epithet over other epithets of correlated anamorphs which are explicitly repressed (e.g. a name for conidiomata is to be protected over names for spermatia or sclerotia). The selected protected names should be incorporated in a published revisable list. The repressed epithet remains legitimate and restorable. It should be cited as an anamorphic synonym with "(nom. repr.)". The protection is effective as long as the synanamorphic connection is not demonstrated erroneous. This rule should be added to Art. 59.4.*

Epithets of correlated anamorphs published after D of an already named species are incorrect and regarded as taxonomic synonyms unless illegitimate as being superfluous.

This procedure does not imply that the selected names are of holomorphic application by typification, but they cover all correlated synanamorphs (pleoanamorphic application). The priority rule does not apply here as synanamorph names are not true synonyms, being so far of strictly monomorphic application (Art. 59.3). The combination of a protected anamorph epithet with the generic name of a correlated anamorph is so far not possible.

- (6) *Accepted and available for use: **anamorph-generic names** of pleoanamorphic fungi typified by a type species connected to an older or protected anamorph name, the epithet of which is repressed. Such generic names keep their legitimate status. The type species must bear the correct name and its anamorph can only be informally referred to in cross-reference form. This rule is to be formulated in the new Art. 59.5.*

PROCEDURE 1B

- (1) Protected and available for use: **teleo-typified epithets** of pleomorphic fungi published *before* or *after D*, unless an anamorph epithet of the same fungus is selected for protection as being the most representative or commonly used if not the earliest name of the taxon, in which case the teleo-typified epithet is repressed and the protected ana-typified epithet assigned holomorphic application. Repressed names are anamorphic or teleomorphic synonyms to be cited as *nomen repressum* ("*nom. repr.*") of the correct name. The repressed epithets remain legitimate and can be restored when the organic connection

is demonstrated erroneous. Protected and repressed names are published in a revisable approved list.

The combination of protected ana-typified epithets of teleo-connected taxa with the appropriate teleo-typified generic name must then be permitted.

Anamorphs of pleomorphic fungi can be addressed, informally, in cross-reference form. Art. 59.1-2-4 are therefore to be amended. Art. 59.5, Art. 59.5 Note 1 and Art. 59A3 are deleted. A new Art. 59.4 is to be proposed to prevent the use of repressed binomials. Otherwise, the combination of an anamorph epithet and a teleomorph-generic name remains ruled by Art. 59.6.

- (2) Accepted and available for use: **anamorph epithets** published *before* or *after D* of anamorphic species or infraspecific taxa as long as they are not teleo-connected *or ana-connected* to another morph.
- (3) Having precedence: **teleomorph-generic names** of pleomorphic fungi published *before* or *after D*, unless a correlated anamorph-generic name is selected as being the most representative or commonly used if not the earliest generic name, for protection against the teleo-typified generic name and for precedence over the correlated anamorph-generic names and available for use with holomorphic application. Repressed teleo-typified generic names remain legitimate and restorable when the connection is demonstrably erroneous. Superseded anamorph-generic names remain legitimate and available for use with restricted anamorphic application. Repressed and superseded generic names are published in a revisable approved list.

It is clear that the exceptional selection of an anamorph-generic name is an infringement on the principle of the procedure strictly applied in option A and to the mechanism of precedence/restriction, as it obliges to use protection/repression against the competing teleo-typified generic name.

- (4) to (6) as in Procedure 1A.

COMMENTS

To make the procedure workable, some preliminary requirements must be fulfilled.

1) Lists / databases must be established of

- the names of teleomorphs with names of correlated anamorphs connected by organic connection or molecular evidence, with dates and references of publication and of demonstration of the organic connection, marking the names of taxa that are generic types
- the names of anamorphs with the names of connected teleomorphs, listed as above.
- *the names of synanamorphs connected by organic connection, with dates and references of publication and of demonstration of the organic connection, marking the names of taxa that are generic types.*
- the names of genera accommodating pleomorphic and pleoanamorphic taxa, with date and reference of publication, the name of their type species, the names of pleomorphic or pleoanamorphic species other than the type and the number of unconnected species.

Published lists such as those of Sutton (1977, 1980), Kendrick & Di Cosmo (1979), Kendrick & Watling (1979), Sutton (1980), Carmichael *et al.* (1980), Sutton & Hennebert (1994), Kendrick's web-page (<www.biology.ualberta.ca/jbrzusto/anatel.php>), and Seifert *et al.* (2002), are already available or almost so. They will greatly help to select and list the anamorph names to be repressed, to select and list the synanamorph names to be protected or repressed, to point out affinities of anamorph genera with

teleomorph (holomorph) genera in a unified classification, and to stimulate critical revisions of the homogeneity of correlated anamorph and teleomorph genera.

It is important to note that the list of repressed anamorph epithets will not be completed at the point D, but it will continue to increase when new organic connections of named anamorphs with extant teleomorphs are discovered.

- 2) The many other unconnected anamorphic fungi must be characterized in terms of affinities with teleomorph taxa. The ultrastructure of septa and the genomic characterization will be of a great help, particularly if involving the type specimens or ex-type strains of the generic type species.
- 3) Teleo-connected taxa will be correctly classified in the appropriate teleomorph genus, with possible reference to the correlated anamorph genus. *Similarly, in pleoanamorphic fungi without teleomorph connection, the protected anamorph name or an informal cross-reference is used for designation of correlated anamorphs.*
- 4) Unconnected anamorph genera should be classified in the appropriate teleomorphic family or order, if their affinities can be demonstrated. Otherwise, they should at least be ranged among either the ascodeuteromycetes or basidiodeuteromycetes in the Asco- or Basidiomycota. Procedure 1 should allow the classification of monophyletic anamorph genera besides the correlated teleomorph genera, and the polyphyletic or paraphyletic ones in the pertinent holomorph family or order.
- 5) Procedure 1A, under Art. 59.1 & 59.4, provides automatic protection to the teleomorph name as name of the holomorph, and automatic precedence of teleomorph-generic names, no matter whether the names are infrequently used or the morph is rarely observed. Also, although classified together in this procedure, always "it will still be necessary to erect new anamorph names for newly discovered anamorphic taxa, and then eventually to replace them with 'new' holomorph names if teleomorphs are discovered" (Seifert *et al.*, 2000). It will involve regular undesirable name changes. Automatic protection of the teleomorph names does not resolve that practical problem. That is why it is suggested that exceptions can be introduced in the automatic mechanism of protection and precedence, by selecting and publishing lists of approved anamorph names to be protected for being the most representative or frequently used. This could make Procedure 1B acceptable to practitioners.

We must realize that such selective protection, even exceptional, of anamorph names that are more commonly used or more representative than the correlated teleomorph names, will assign the selected anamorph names holomorphic application. This is twisting the principle of this Procedure and will require further amendment of Art. 59. The same holomorphic application will be necessarily assigned to anamorph-generic names exceptionally selected for precedence. This remark also holds for Procedures 3B, 4B, 5B and 6B.

FORMAL PROPOSALS

CHAPTER VI, new title: "Names of non-lichen-forming ascomycetous and basidiomycetous fungi."

TYPE DEFINITION

- 1) In Art. 7.9 in place of "fungal anamorphs" insert "anamorphic fungi" and in Note 1 after "pleomorphic"

insert "*and pleoanamorphic*".

DUAL NOMENCLATURE

2) In Art. 11.1 Delete "for the form-taxa of fungi" and "and 59.5".

TYPE IN HIGHER FUNGI

3) In Art. 59.1 after "representing the teleomorph" delete "i.e. the morph ... organs." and insert "unless another name for the same fungus published before [D] is protected as the correct name (Art. 59.4 and 4bis)."

4) In Art. 59.2 after "teleomorphic" insert "characterized by ... organs." from Art. 59.1. Add to Art. 59.2 the first sentence of 59.3: "If these requirements ... protologue."

APPLICATION OF NAMES IN GENERA

5) In Art. 59.3 delete the first sentence transferred in Art. 59.2; in the second sentence after "author's" insert "typified by a teleomorph or an anamorph with reference to Art. 51.1."

PROTECTION OF SPECIES NAMES

6) Replace Art. 59.4 by new Art. 59.4:

{Under Procedure 1A}: "Irrespective of priority, names typified by a teleomorph are protected as the correct name covering the holomorph against earlier names typified by a correlated anamorph, [{add under Procedure 1B:} unless a name typified by a correlated anamorph is selected as the most representative or commonly used and explicitly protected as such, against earlier names typified by a correlated morph]; the latter names are repressed, as long as their types are judged to belong to the same taxon." *"Amongst names of correlated anamorphs of pleoanamorphic fungi, one name is selected and explicitly protected as such, being the most representative or commonly used if not the earliest, against the other names that are repressed, as long as the types are judged to belong to the same taxon."* "Repressed names are cited in synonymy as *nomen repressum* ("*nom. repr.*"); they are legitimate and remain available when they can be shown to be typified by a different taxon. Protected and repressed names are published in a revisable approved list."

PRECEDENCE OF GENERIC NAMES

7) Introduce new Art. 59.4 bis: "Names of genera typified by a teleomorph take precedence as the correct holomorph-generic name over superseded earlier names of genera typified by a correlated anamorph [{add under Procedure 1B:} unless a generic name typified by a correlated anamorph is selected as the most representative or commonly used if not the earliest, and protected with holomorphic application against the repressed generic name typified by the teleomorph]; the latter names are superseded as long as the types are judged to belong to the same taxon."

"The names of genera typified by an anamorph of a pleoanamorphic taxon, selected as the most representative or commonly used and explicitly protected, if not the earliest name, take precedence over other superseded generic names typified by a correlated anamorph; the latter names are superseded, as long as the

types are judged to belong to the same taxon." "Superseded generic names, like other generic names typified by an anamorph are legitimate and remain available for use, restricted in application to the morph represented by their ultimate type. [add under Procedure 1B:] Repressed teleomorph-generic names remain legitimate and restorable for use when the connection between morphs is demonstrably erroneous.""]"

PREVENTION OF DUAL NAMES

8) Replace Art. 59.5 and Examples by new Art. 59.5: "Separate binomials for named pleomorphic and pleoanamorphic specific and infraspecific taxa are repressed (Art. 59.4). Publication and use of names for genera typified by an anamorph, even when correlated to named teleomorph species in teleomorph genera having precedence {or otherwise protected anamorph genera}, is possible when desirable to accommodate anamorphic taxa."

CITATION OF TYPE SPECIES

9) Replace Note 1 by new Note 1: "When the name of the type species of an anamorph-generic name is repressed, this species is to be cited by its correct name (see also Rec. 59A.)"

NEW COMBINATION

10) Maintain Art. 59.6; Examples should be amended according to Art. 59.1, 59.4 and 4bis, 59.5 and Note 1.

INDICATION OF RANK

11) In Rec. 59A.1 in place of "anamorph (anam. nov.);" insert "anamorphic taxon (anam. gen. nov., anam. sp. nov.)"

CROSS-REFERENCE CITATION OF ANAMORPHS

12) Delete Rec. 59A.2 and 59A.3 and introduce new Rec. 59A.2: "Where it is considered necessary or desirable to specifically refer to an anamorph of an otherwise correctly named fungus, provisions of this article do not prevent the use of informal designations based on the anamorph generic name in cross-reference to the correct name, or on the same in a decapitalized form.

13) Add a new Ex. to Rec. 59A.2: "The *Stemphylium* anamorph of *Pleospora herbarum* (Fr.) Rabenh. ex Ces. & De Not. 1863 should be informally referred to as: *Pleospora herbarum* (*Stemphylium* anamorph), *P. herbarum* (*stemphylium* state), *Stemphylium* state of *P. herbarum*; *stemphylium* state of *P. herbarum*, etc., rather than as *Stemphylium herbarum* E.G. Simmons 1986."

PROCEDURE 2

Principle: All generic names or epithets, whether based on anamorphic or teleomorphic types, published before or after D, are to be considered as of holomorphic application, retroactive back to the starting point of the taxonomic groups concerned.

This retroactive change of the type application totally eliminates anatomical typification, the basis of Art. 59, from the *Code*.

Because of the extended application of their types in agreement with Art. 7.2, all anamorph epithets and generic names previously (until D) considered restrictedly anamorphic by typification would now become of holomorphic application and compete for priority with any later teleo-typified or ana-typified epithet for the same fungus. This change would immediately suppress the dual nomenclature in both pleomorphic fungi and pleoanamorphic fungi, *with retroactive effect*. By virtue of that extended holomorphic application of ana-typified names, no discriminated anamorph names or taxa are left. There are no more anamorph epithets or generic names under this Procedure, but ana-typified names with holomorphic application.

When strictly applied, the procedure leaves full play to priority and consequently necessary recombinations of names. This would cause considerable changes of names in use for pleomorphic and pleoanamorphic fungi, rendering ana-typified names correct when they are older than names of associated teleomorphs. Also the older ana-typified generic names acquiring holomorphic application will accommodate both teleomorphic and anamorphic taxa with numerous recombinations becoming necessary. The most drastic change will be that in the new concept previously discriminated names of anamorphic genera and species will receive priority. This destabilizing effect will not be welcome, neither to taxonomists nor to practitioners.

When enacting this procedure, many taxonomic problems need to be solved, particularly when synonymy appears evident, on the basis of the type species, between teleo-typified generic names and polyphyletic or paraphyletic ana-typified generic names, and also between teleo-typified names and ana-typified names of aggregate taxa. These problems were well addressed by Cannon & Kirk (2000).

The exact impact of such nomenclatural disruption can be evaluated only on the basis of complete lists of pleomorphic and pleoanamorphic fungi with dual (or multiple) nomenclature, and prior to a decision about how to proceed.

Indeed, Procedure 2, as defined in its principle, does not imply protection or precedence, neither of teleo-typified names nor of ana-typified names, epithets and generic names published before D in order to preserve current nomenclature. Art. 59 is simply deleted retroactively, all types being of holomorphic application, the rule of priority having free play. This will probably cause what Hawksworth (2001 *in litt.*, see this website) qualifies as nomenclatural chaos. Indeed, a full nomenclatural revision of the pleomorphic and pleoanamorphic fungi will be needed to select the earliest available epithet combined to the earliest available generic name as the one correct name, no matter whether the type is anamorphic or teleomorphic or whether the teleomorphic element of the fungus is included in the protologue or not, as ruled by Art. 7.2: "The nomenclatural type is not necessarily the most typical or representative element of a taxon nor necessarily the anamorph or the teleomorph in fungi."

To reduce the foreseeable nomenclatural chaos, it is necessary to introduce some rules to protect existing and presently prevailing teleomorph names. There are two alternatives, either (2A) to *automatically* protect all extant teleo-typified epithets and generic names against possibly competing ana-typified epithets and generic names which would be repressed as long as the connection is confirmed, or (2B) to also protect

selectively (the selection to be published in a list and approved) certain ana-typified holomorphic epithets and generic names, depending on use and on how representative they are. *The second alternative is the only one available in cases of pleoanamorphic fungi with no teleo-connection.*

Of these alternatives, the first one will automatically exclude from use current ana-typified names of pleomorphic fungi commonly used by practitioners, while the second one will allow to reach a consensus about certain protected names.

It is clear that all other extant or future ana-typified names of taxa not connected with any other taxon are, under this procedure and its alternatives 2A or 2B, of holomorphic application and are applicable to the holomorph when a teleomorph is newly discovered.

It is evident that both options 2A or 2B of this Procedure allow a unified nomenclature in a unified classification of the higher fungi.

NEW RULES SHOULD DECLARE:

PROCEDURE 2A (Figs. 3, 4, 5)

(1) Repressed and unavailable for use: **ana-typified epithets** of teleo-connected species and infraspecific taxa, when prior to and competing with epithets of teleo-typified species published *before D*; until this date, teleo-typified names are *automatically* protected. The repressed epithets remain legitimate and are taxonomic synonyms cited as ("*nom. repr.*"). Binomials of teleo-typified species regulated by Art. 59.6 and published before D are legitimate.

(2) Accepted and available for use: **ana-typified epithets** of species and infraspecific taxa published *before and after D*, when unconnected for anamorphic species or when teleo-connected, if no teleo-typified name has been published *before D*, for the denomination of the holomorph.

Ana-typified epithets, being of holomorphic application, obey the priority rule unless a protected teleo-typified epithet published *before D* is available for the same taxon. When a species is teleo-connected, the ana-typified epithet, if not explicitly repressed under (1), is available for combination with any available appropriate generic name published before or after D.

(3) Repressed and not available for use: **ana-typified generic names** published *before D* and teleo-connected through their type or another species, when prior to and competing with teleo-typified generic names published *before D* which are *automatically* protected. Such repressed names are taxonomic synonyms ("*nom. repr.*"), but they remain legitimate and restorable for use when the connection is demonstrated erroneous.

All teleo-typified names of genera published *before D* are protected by repression of possibly competing ana-typified generic names. Those repressed generic names are therefore no longer available for unconnected ana-typified species which normally should be accommodated in the respective protected genus.

(4) Accepted and available for use: **ana-typified names of genera** published *before or after D*, unconnected or found teleo-connected through their type species in absence of teleo-typified names of genera published *before D*, for denomination of a holomorph genus. When an ana-typified generic name

published *after D* is found correlated to a teleo-typified generic name published *before D* by their ana-teleo-connected type species, its generic name is synonymized with the earlier generic name. If these generic names are correlated by any non-type species only, the species may be transferred to their best taxonomic position.

Explicit reference to the anamorph or correlated anamorph of pleomorphic *or pleoanamorphic* fungi cannot be made by cross-reference designation using Latin or decapitalized ana-typified generic names, the latter being all of holomorphic application, but by paraphrasing using terms like "anamorph of <correct name>".

- (5) *Protected: ana-typified **epithets of pleoanamorphic fungi** published before D, when they are selected as being either most commonly used, or the most representative, against the earliest published (then the priority rule plays simply between names of correlated anamorphs), or any earlier names of correlated anamorphs which are then repressed and not available for use (e.g. protection of a name for conidiomata over names for spermatia or sclerotia). The repressed names remain legitimate and are treated as true taxonomic synonyms ("nom. repr."). The selected protected names are published in a revisable approved list.*

Epithets of correlated anamorphs published after D of an already named species are incorrect and regarded as taxonomic synonyms, if not illegitimate being superfluous.

- (6) *A **generic name** typified by a **pleoanamorphic** species, the correct name of which includes (according to 5) the name of a protected genus, becomes a synonym of the latter.*

PROCEDURE 2B

(1) to (4) above are to be replaced by one item:

- (1) Protected and available for use: teleo-typified names (epithets and generic names) of pleomorphic fungi published *before D*, unless correlated ana-typified names, selected, irrespective of priority, amongst available names published *before D* of the same pleomorphic fungus for being the most representative or most commonly used if not the earliest, for as long as the identity of the named taxa is firmly established and unambiguous, the repressed names remaining legitimate and restorable. Protected and repressed names are published in a list and approved. All other teleo-typified or ana-typified names (epithets and generic names) published before or after D of not firmly or unambiguously connected or unconnected taxa published before D are not protected or repressed and available for use with holomorphic application.

Explicit reference to the anamorph or correlated anamorph of pleomorphic *or pleoanamorphic* fungi cannot be made by cross-reference designation using Latin or decapitalized ana-typified generic names, the latter being all of holomorphic application, but by paraphrasing using terms like "anamorph of <correct name>".

- (5) *and (6) as in Procedure 2A.*

COMMENTS

- 1) Listing of names established before D is equally indispensable as with Procedure 1.

It is assumed that the change of anatomical to botanical typification suppressing the dual nomenclature in both pleomorphic fungi and pleoanamorphic fungi *with retroactive effect* would necessitate a large number of name changes if the rule of priority were strictly applied. This assumption requires verification by analysis of the stipulated lists of names of anamorph--teleomorph and anamorph--anamorph connected cases, the dates of publication and the status of the respective specific and generic names, as determined by typification. Those lists should allow to establish the number of name changes that would be necessary either by strict application of priority (Proc. 2), or by automatic protection of all teleo-typified names (Proc. 2A) or by the selective protection of some teleo- or ana-typified ones (Proc. 2B), irrespective of priority.

In both Procedures 2A and 2B with automatic or selective protection of names, it should be noted that the list of repressed names cannot be settled until date D, as new connections of ana-typified taxa with teleo-typified taxa named before D can possibly be demonstrated after D.

- 2) Procedure 2 does not involve protection of names published before D. The rule of priority is applied retroactively, leading to a large number of recombinations and name changes. For reasons already formulated, conservation of names is excluded. Only protection/repression can reduce the number of name changes.

Procedure 2A would protect all teleomorphic holomorph names (generic names and epithets) published before D against earlier ana-typified names, whether generic names or epithets, and repress the latter ones, no matter whether the connection is demonstrated before or after D. All other extant and future ana-typified names, generic names and epithets are of holomorphic application and can efficiently compete with any teleomorph name created after D.

- 3) *For pleoanamorphic fungi, all names of correlated anamorphs are of holomorphic application, therefore true synonyms, the type of one anamorph being equal in application to the type of a correlated anamorph of the same fungus.*

Application of full priority to pleoanamorphic fungi will lead to the disappearance of the most commonly used or the most representative names of certain fungi into synonymy. That is why protection of such names is recommended; listing of established priorities amongst synanamorphic names existing before D is necessary. This leads to the synonymy of synanamorphic names of the same fungus. This the situation described by Gams (1982).

- 4) Procedure 2A, however, has some disadvantages. Many name changes will still be necessary after the synonymy of ana-typified generic names with protected teleo-typified generic names, e.g. *Trichoderma* synonym of *Hypocrea*, with recombination of the ana-typified unconnected *Trichoderma* species into *Hypocrea*, although they do not have ascomata. Those name changes will confuse users. Taxonomic problems also will arise with polyphyletic or paraphyletic ana-typified genera in a united classification, e.g. *Fusarium* synonym of *Gibberella*, also comprising species of *Haematonectria* and unconnected ana-typified species distributed and recombined. Under Procedure 2B, where the names *Trichoderma* and *Fusarium* would be correct earliest holomorph names to be protected, some disadvantageous name changes will occur but in the reverse direction. However, Procedure 2B might comply with the needs of practitioners.

- 5) In the Procedures 2A or 2B, the terms anamorph, teleomorph and holomorph, as well as anamorphosis, teleomorphosis and holomorphosis become obsolete. All fungi are treated botanically in a Linnaean system. The taxonomies are integrated. Fungal nomenclature is no longer dual. Forms, states, anamorphs or organs of the fungi have no more Latin designation.
- 6) To possibly reduce the number of name changes further, it might be conceived to retain repressed anamorphified generic names in their restricted anamorphic application and still available for that use. This is what is proposed in Procedure 6.

FORMAL PROPOSALS

Procedure 2, with no protection/repression nor precedence/restriction of names.

CHAPTER VI new title: "Names of ascomycetous and basidiomycetous fungi."

TYPE DEFINITION

- 1) In Art. 7.2 after "of a taxon" insert "or anamorphic or teleomorphic element on the fungi, including the non-lichen-forming ascomycetous and basidiomycetous fungi."
- 2) In Art. 7.4 delete reference to Art. 59.6.
- 3) In Art. 7.9 delete "of fungal anamorphs (Art. 59)" and delete Note 1.

DUAL NOMENCLATURE

- 4) In Art. 11.1 delete "for the form taxa of fungi and" and "and 59.5"

TYPE IN HIGHER FUNGI

- 5) In Art. 59.1 after "legitimate name" insert "no matter whether", after "representing the teleomorph" the words "or the anamorph" and delete "i.e. the morph ... organs". Add at the end "Later names for the same fungus, even if supposed to designate a separate morph, are incorrect."
- 6) Delete Art. 59.2
- 7) In Art. 59.3 (becoming 59.2) delete "If these in the protologue." and in the second sentence in place of "holomorphic" insert "teleomorphic".
- 8) Delete Art. 59.4
- 9) Delete Art. 59.5, Examples and Note 1 and introduce new Art. 59.3 "This article prevents the publication and use of names for distinct morphs of the same fungus."
- 10) Delete Art. 59.6 and Examples.
- 11) Delete Rec. 59A.1 to 59A.3.

Procedures 2A and 2B (with protection/repression and precedence/restriction of names)

CHAPTER VI new title: "Names of non-lichen-forming ascomycetous and basidiomycetous fungi."

TYPE DEFINITION

- 1) In Art. 7.2 after "of a taxon" insert "or anamorphic or teleomorphic element of the fungi, including the non-lichen-forming ascomycetous and basidiomycetous fungi."
- 2) In Art. 7.4 delete reference to Art. 59.6.
- 3) In Art. 7.9 delete "of fungal anamorphs (Art. 59)" and in Note 1 after "pleomorphic" insert "and pleoanamorphic".

DUAL NOMENCLATURE

- 4) In Art. 11.1 delete "for the form taxa of fungi and" and "and 59.5"

TYPES IN HIGHER FUNGI

- 5) In Art. 59.1, after "legitimate name" delete "typified ... organs." and insert "no matter whether typified by an element representing the teleomorph or the anamorph, unless another name of the same published before [D] is protected as the correct name (Art. 59.4 and 4bis)." Delete Ex. 1.
- 6) In Art. 59.2 after "binary name" insert "of pleomorphic fungi published before [D]" and after "teleomorphic" insert "characterized by ... organs." from Art. 59.1. Add to this Art. the first sentence of 59.3. "If these requirements ... protologue."

APPLICATION OF NAMES IN GENERA

- 7) In Art. 59.3 the first sentence is transferred to Art. 59.2, in the second sentence after "author's" insert "typified by a teleomorph or an anamorph with reference to Art. 51.1."

STATUS OF SPECIES NAMES PUBLISHED BEFORE [D]

- 8) Replace Art. 59.4 by new Art. 59.4: "Irrespective of priority, names published before [D] typified by a teleomorph are protected as the correct name covering the holomorph against earlier names typified by a correlated anamorph, [add under Procedure 2B:] unless a name typified by a correlated anamorph is selected as the most representative or commonly used and explicitly protected as such, against competing names typified by a correlated teleomorph]; the latter names are repressed, as long as their types are judged to belong to the same taxon."

*"Amongst names of correlated anamorphs of pleoanamorphic fungi published before [D], one name is selected and explicitly protected as the most representative or commonly used if not the earliest, against the other names that are repressed, as long as the types are judged to belong to the same taxon. Repressed names are cited in synonymy as *nomen repressum* ("nom. repr."); they are legitimate and remain available when it is shown that they are typified by a different taxon. Protected and repressed names are published in a revisable approved list."*

STATUS OF GENERIC NAMES PUBLISHED BEFORE [D]

- 9) Introduce new Art. 59.4bis:

"Names of genera published before [D] typified by the teleomorph are protected [{add under Procedure 2B:} unless an anamorph is selected as being the most representative or commonly used, if not the earliest, and protected] as the correct holomorph-generic names against earlier names of genera typified by a correlated anamorph; the latter names are repressed, as long as the types are judged to belong to the same taxon." *"Names of genera published before [D] typified by an anamorph of pleoanamorphic taxa, selected as the most representative or commonly used, if not the earliest name, are explicitly protected against earlier generic names typified by a correlated anamorph; the latter names are repressed, as long as anamorphic types are judged to belong to the same taxon."*

Repressed generic names are cited in synonymy as *nomen repressum* (*nom. repr.*); they are legitimate and available for use, restricted in application to the morph represented by their ultimate type. Protected and repressed generic names are published in a revisable approved list.

PREVENTION OF DUAL NAMES

10) Replace Art. 59.5, Ex. 2 and 3, by new Art. 59.5: "Separate binary names published after [D] of anamorphs where the teleomorph or a correlated anamorph is named, or of teleomorphs where the anamorph is named are illegitimate and to be rejected as being superfluous when homotypic or incorrect as synonym when heterotypic."

DESIGNATION OF EPITYPE

11) Insert a new Note 1: "Where a teleomorph has been discovered for a fungus hitherto known only as an anamorph with a name published before or after [D], the name typified by the anamorph applies to the holomorph and an epitype with the teleomorph may be designated for that name."

NEW COMBINATIONS

12) Maintain Art. 59.6 and insert at the beginning "For names of pleomorphic fungi published before D," and amend Examples.

INDICATION OF RANK

13) Delete Rec. 59A.1 and Rec. 59A.2

CROSS-REFERENCE CITATION OF ANAMORPHS

14) Delete Rec. 59.3.

PROCEDURE 3

Principle: All epithets, whether based on a teleomorphic or an anamorphic type published before or after D, are to be considered as of holomorphic application, retroactively back to the starting-point of the taxonomic group concerned. Names of genera based on anamorphic type material, whether

published before or after D, remain of restricted application to anamorphs.

This procedure is principally identical with Procedure 2 at species level, and with Procedure 1 at generic level.

The procedure introduces only a change from anatomical to holomorphic application of ana-typified epithets *with retroactive effect and for ever*. This retroactivity applies to all ana-typified epithets of both pleomorphic fungi and anamorphic fungi. It maintains *for ever* an anatomical application of anamorph-generic names, allowing classification of anamorphic fungi in restricted anamorphic genera. It also allows an adequate but informal generic designation of anamorphs of pleomorphic fungi and pleoanamorphic fungi by cross-reference.

Because of the retroactivity of the change from anamorphic to holomorphic application of ana-typified epithets, this procedure, if its principle is strictly applied, would induce a large number of necessary recombinations of the earliest teleo-connected ana-typified epithets into holomorph genera. To avoid these recombinations, repression of the competing ana-typified epithets and a restricted use of anamorph-generic names are proposed in Procedure 3A.

Procedure 3A applies fully automatic protection of teleo-typified epithets published before D against competing earlier ana-typified epithets (see the botanical system and rules 1, 2 and 4 of Procedure 2A). It retains restricted anamorphic application for anamorph-generic names, separate from teleomorph-generic names (see the anatomical system still governed by Art. 59 at generic level only and rule 3 of Procedure 1). Consequently, the only acceptable generic names for sexual holomorphs are teleo-typified.

As an alternative, in Procedure 3B certain ana-typified epithets can be selected for protection, being the most representative or commonly used, if not the earliest, as exceptions to the automatic protection of teleo-typified epithets.

NEW RULES SHOULD DECLARE:

PROCEDURE 3A (Figs. 3, 4, 5)

- (1) Repressed and unavailable for use: **ana-typified epithets** of teleo-connected species and infraspecific taxa published *before D*, when published prior to and competing with teleo-typified epithets of species published *before D*, which are automatically protected. The repressed names are synonyms cited as "*nom. repr.*"; they remain legitimate and are restorable when the ana-teleo connection is demonstrated to be erroneous.

Ana-typified synonyms are inappropriate for the explicit designation of the anamorph of a species, the epithets being of holomorphic application.

- (2) Accepted and available for use: **ana-typified epithets** published *before or after D* of unconnected species or infraspecific taxa, for denomination of anamorphic species or, when teleo-connected in the absence of a teleo-typified epithet published before D and prior to other available epithets, for addressing teleomorphic holomorphs.

Ana-typified epithets, being of holomorphic application, obey the priority rule unless, when found

teleo-connected, they are repressed by a protected teleo-typified epithet published *before D*.

Combinations of ana-typified holomorph epithets with any anamorphic generic name published *before or after D* are legitimate and remain of holomorphic application by virtue of Art. 59.3 second sentence.

Combinations of anamorph epithets with teleo-typified generic names made *before D* for pleoanamorphic fungi, remain regulated by Art. 59.6. *After D*, combinations of unrepressed ana-typified holomorph epithets published before D with teleo-typified generic names published before or after D are legitimate and the anamorph can be informally designated by cross-reference using the anamorph-generic name.

- (3) Having precedence and available for use: **teleo-typified generic names** published *before or after D* over correlated anamorph generic names, by holomorphic application of their teleomorphic type (like in present Art. 59).
- (4) Accepted and available for use: **anamorph-generic names** published *before or after D*, of restricted anamorphic application by their anamorphic type, even when the epithet of their ana-typified type species is of holomorphic application and even if the type or another species is connected to a teleomorph and its epithet may therefore be repressed.

Species names (epithets and binomials) are of holomorphic application. When naming a teleomorphic holomorph, its correct generic name must be that of a teleomorphic genus. When naming an anamorphic holomorph, its correct generic name is that of an anamorph genus. Teleo-connected type or other species of anamorph genera are to be cited by their correct holomorph name. The anamorphs of such species can be informally addressed in cross-reference form.

Names of anamorph genera, the type species of which is connected to a teleomorph, are not to be repressed but are superseded because of their restricted anamorphic application and available to accommodate unconnected species even when their name is an anamorphic synonym of a teleo-typified generic name. Such generic names are not emendable, their anamorphic circumscription being fixed for ever. Anamorph-generic names published before or after D remain available for the informal designation of anamorphs of teleo-connected species in cross-reference form.

- (5) *Protected and available for use: **anamorph epithets of pleoanamorphic fungi** published before D, selected for being either the most commonly used or the most representative, if not the earliest published, against any epithet of synanamorphs then automatically repressed and not available for use (e.g., a name for conidiomata to be protected over names for spermatia or sclerotia). Repressed epithets remain legitimate and are treated as taxonomic synonyms.*

Epithets of synanamorphs published after D for an already named species are incorrect and regarded as taxonomic synonyms.

- (6) *Accepted and available for use: **anamorph-generic names of pleoanamorphic fungi** even if typified by an ana-connected species the epithet of which is repressed. Such generic names remain available with restricted anamorphic application to accommodate unconnected species. Ana-connected type and other species are addressed formally by their correct name or informally in cross-reference form.*

PROCEDURE 3B

- (1) Protected and available for use: **teleo-typified epithets** of pleomorphic fungi published *before D*, unless an anamorph epithet of the same fungus is selected for protection as being the most representative or commonly used if not the earliest name of the taxon, in which case the teleo-typified epithet is repressed and the protected ana-typified epithet assigned holomorphic application. Repressed names are taxonomic synonyms to be cited as *nomen repressum* ("*nom. repr.*") of the correct name. Repressed epithets remain legitimate and can be restored when the organic connection is demonstrated erroneous. Protected and repressed names are published in a revisable approved list. Anamorphs of pleomorphic fungi can be addressed informally in cross-reference form.

Protected ana-typified epithets of teleo-connected taxa can be recombined with the appropriate teleo-typified generic names if protected.

- (2) As above.
- (3) Having precedence: **teleo-typified generic names** published *before or after D*, unless a correlated anamorph-generic name is selected as being the most representative or commonly used if not the earliest, for protection against a correlated teleo-typified generic name and over correlated anamorph-generic names, which then receives holomorphic application. Repressed teleomorph-generic names remain legitimate and restorable when the connection is demonstrably erroneous. Superseded anamorph-generic names remain legitimate and available for use with restricted anamorphic application. Repressed and superseded generic names are published in a revisable approved list.

It is clear that this exceptional selection of an anamorph-generic name is an infringement on the principle of the procedure strictly applied in option A and to the mechanism of precedence/restriction, as it obliges to use protection/repression against a competing teleo-typified generic name.

- (4) to (6) as above.

COMMENTS

- 1) In both Procedures 3A and 3B, all anamorph-generic names, even when their type species is later teleo-connected, are, in agreement with their protologue, form-generic names, restrictedly accommodating anamorphic fungi. The only correct binomial of teleomorphic holomorphs is therefore the combined ana- or teleo-typified epithet with a teleo-typified generic name. Anamorph-generic names are available for anamorphic species and for the informal designation of connected anamorphs. Under Procedure 3B, exceptions are possible where anamorph-generic names are given precedence and protection and are therefore the sole correct generic names applying to the holomorph.
- 2) In this procedure, binomials for anamorphic fungi consist of the combination of a holomorphic ana-typified epithet in an anamorph-generic name; but they are of holomorphic application. Under Art. 59.3 second sentence, of the present *Code*, the application of a binomial is indeed independent of the application of the generic name.

According to the present Art. 59.6, the combination of an ana-typified epithet of anamorphic application with a teleo-typified generic name of holomorphic application remains anamorphic in application and cannot cover the teleomorphic holomorph, when the combination is made, the binomial

would be considered as the name of a new species. Under this procedure, the ana-typified epithet retroactively being declared of holomorphic application after a certain date D, the transfer of ana-typified epithets to a teleo-typified generic name would be perfectly acceptable as a new combination if introduced after D.

- 3) Generic names still obey the principle of anatomical typification (retaining the function of Art. 59 at the generic level only) and are thus either teleo-typified with holomorphic application or ana-typified with restricted anamorphic application. However, all epithets are of holomorphic application and thus after D transferable from an ana-typified to a teleo-typified generic name [or conversely in exceptions of Procedure 3B], while the present Art. 59.6 remains in vigor for combinations published before D.
- 4) This procedure mixes two philosophies (anatomical and botanical) and it is not easily applied. Considering the needed name changes, Procedure 3A, is equivalent to Procedures 2A, 5A and 6A by attributing automatic protection to teleo-typified epithets (Fig. 1), but Procedure 3A, 5A and 6A, differs from Procedure 2A in attributing precedence instead of protection to the teleo-typified generic names, granting the availability of the superseded anamorph-generic names for unconnected anamorphic fungi.

But in Procedure 3B ana-typified generic names can be exceptionally selected for protection over correlated teleo-typified generic names, possibly reducing the number of name changes, like in other options B. However, in Procedure 3B recombinations will be needed all the time after D when new connections are found in anamorphic fungi published before or after D.

- 5) What is then the exact application of the name of an anamorph genus, its type species being pleomorphic and bearing an holomorph epithet based on a anamorphic type (the generic type)?

In a botanical system, like in that for lichenized fungi, genera mainly characterized by asexual features exist besides genera mainly characterized by sexual features and species can easily be transferred from one to the other genus. Genus names introduced for asexual structures are not restricted in application; they are botanical genera defined by their protologue, and they can be amended according to the nature of their type species when found to be sexual; their names then may become synonyms of names of other sexual genera. In Procedures 3A and 3B, which maintain a dual generic nomenclature (form-genera besides Linnaean genera), when the type species of an anamorph genus is found sexual, the generic name retains its anamorphic application and is superseded by a teleo-typified generic name, rather than being holomorphic like in a botanical system.

In option 3B, like in 4B to 6B, besides the mechanism of automatic precedence/restriction applied in favour of teleo-typified generic names over anamorph-generic names, protection/repression can be applied in favour of selected anamorph-generic over teleo-typified generic names; they then are assigned holomorphic application.

FORMAL PROPOSALS

CHAPTER VI new title: "Names of non-lichen-forming ascomycetous and basidiomycetous fungi."

TYPE DEFINITION

- 1) In Art. 7.2 after "of a taxon" insert "or an anamorphic or teleomorphic element of the fungi, including the non-lichen-forming ascomycetous and basidiomycetous fungi."
- 2) In Art. 7.9 delete "anamorphs" and insert "anamorph genera"; in Note 1 after "pleomorphic" insert "and pleoanamorphic".

DUAL NOMENCLATURE

- 3) In Art. 11.1 delete "for the form-taxa of fungi and" and "and 59.5"

TYPE IN HIGHER FUNGI

- 4) In Art. 59.1 after "legitimate name" delete "typified ... organs." and insert "no matter whether typified by an element representing the teleomorph or the anamorph, unless another name of the same fungus published prior to [D] is protected as the correct name (Art. 59.4). Names of genera published before or after [D] typified by an anamorph, no matter whether their type species is pleomorphic, *pleoanamorphic* or not, are restricted in application to the anamorph represented by their type, [{add under 3B:} unless the generic name is assigned protection] and holomorphic application (Art. 59.4bis)." Delete Ex.1.
- 5) In Art. 59.2 after "binary name" insert "of pleomorphic fungi" and after "teleomorphic" insert "characterized by ... organs." from Art. 59.1. Add to this Art. the first sentence of 59.3: "If these requirements ... protologue."

APPLICATION OF NAMES IN GENERA

- 6) In Art. 59.3 delete the first sentence [now in Art. 59.2] and in the second sentence after "author's" insert "typified by a teleomorph or an anamorph."

STATUS OF SPECIES NAMES PUBLISHED BEFORE [D]

- 7) Replace Art. 59.4 by new Art. 59.4:

"Irrespective of priority, names published before [D] typified by a teleomorph are protected as the correct name covering the holomorph, [{add under Procedure 3B:} unless a name typified by a correlated anamorph is selected as the most representative or commonly used and therefore explicitly protected] against prior names typified by a correlated anamorph; the latter are repressed, as long as the types are judged to belong to the same taxon."

*"Amongst names of correlated anamorphs of pleoanamorphic fungi published before [D], one name is to be selected and explicitly protected as the most representative or commonly used if not the earliest, against other names that are repressed, as long as the types are judged to belong to the same taxon. Repressed names are cited in synonymy as *nomen repressum* ("nom. repr."); they are legitimate and remain available when demonstrably typified by a different taxon. Protected and repressed names are to be published in a revisable approved list."*

PRECEDENCE OF GENERIC NAMES

- 8) Introduce new Art. 59.4bis:

"Names of genera published before or after [D] typified by a teleomorph take precedence as the correct holomorph generic name over earlier, superseded names of genera typified by a correlated anamorph, [{add under Procedure 3B:}] unless a generic name typified by a correlated anamorph is selected as being the most representative or commonly used, if not the earliest, and protected as the correct holomorph-generic name against an explicitly repressed generic name typified by a teleomorph,] as long as the types are judged to belong to the same taxon."

"Among names of genera published before or after [D] typified by an anamorph of a pleoanamorphic taxon, the most representative or commonly used, if not the earliest, is to be selected to take precedence with anamorphic application over the other generic names typified by a correlated anamorph; the latter names are superseded, as long as the types are judged to belong to the same taxon. Superseded generic names, and other names of genera published before [D] typified by an anamorphic species, are legitimate and available for use, restricted in application to the morph represented by their ultimate type. [{add under Procedure 3B:}] Repressed teleomorph-generic names remain legitimate and restorable for use when the connection between morphs is demonstrably erroneous."

PREVENTION OF DUAL NAMES

9) Replace Art. 59.5 and Examples by new Art. 59.5: "Separate binary names published after [D] for anamorphic fungi when the teleomorph or a correlated anamorph is already named, or for teleomorphs when the anamorph is named, are illegitimate and to be rejected, being superfluous when homotypic, or incorrect as synonyms when heterotypic."

CITATION OF TYPE SPECIES

10) Replace Note 1 by new Note 1: "The type species of an anamorph-generic name, the binary name of which is repressed, is to be cited by its correct name (see also Rec. 59A.1)."

NEW COMBINATIONS

11) Maintain Art. 59.6 and insert at the beginning "For names of pleomorphic fungi published before [D],".
 12) Introduce new Art. 59.6bis: "After [D], specific and infraspecific epithets published before [D], typified by an anamorph but of holomorphic application, if found connected to a teleomorph, can legitimately be combined with a generic name typified by a teleomorph, provided the requirements for valid publication of a new combination (Art. 33 and 34) and in respect of Art. 59.2 to 59.5 are fulfilled."

DESIGNATION OF EPITYPES

13) Introduce new Note 2 after Art. 59.6bis: "Where a teleomorph has been discovered for a fungus hitherto known only as an anamorph, the name of the anamorph, even if published before [D], applies to the teleomorph and an epitype that includes the teleomorph is to be designated for fixing application of the name".

INDICATION OF RANK

14) Delete Rec. 59A. 1 and 59A.2.

CROSS-REFERENCE CITATION OF ANAMORPHS

15) Delete Rec. 59A.3 and introduce new Rec. 59A.1: "Where it is considered necessary or desirable to refer to an anamorph alone of an otherwise correctly named fungus, this provision does not prevent the use of informal designations based on the correct name and a Latin or decapitalized name of a superseded anamorph-generic name or common terms like "anamorph" or "conidial state" ("anam." or "st. con.").

16) Add a new Ex. 59A.1: The *Stemphylium* anamorph of *Pleospora herbarum* (Fr.) Rabenh. ex Ces. & De Not. 1863 should be informally referred to as: *Pleospora herbarum* (*Stemphylium* anamorph), *P. herbarum* (stemphylium state), *Stemphylium* state of *P. herbarum*, stemphylium state of *P. herbarum*, etc., rather than as *Stemphylium herbarum* E.G. Simmons 1986.

PROCEDURE 4

Principle: The anatomical typification (restricted anamorphic application) of both anamorph-generic names and epithets published before D is retained; both ana-typified and teleo-typified generic names and epithets published after D are declared applicable to the holomorph.

Procedure 4 maintains for ever the restricted anatomical application of anamorph-generic names and epithets published *before D*, in adherence to Art. 59.1-4 and 59.6. All *new* ana-typified or teleo-typified generic names or epithets published *after D* will be of holomorphic application.

Contrasting with Procedure 3, Procedure 4 is a combination of Procedure 1 for names published before D and of Procedure 2 for all names published after D. The present Art. 59 will not be abandoned before all anamorphic species published before D are connected to a teleomorph. Anamorphic genera published before D will continue to restrictedly accommodate extant anamorphic species and new ana-typified species published after D, while new ana-typified generic names will be holomorphic and eventually combine both ana-typified and teleo-typified species.

To eliminate dual nomenclature, Procedure 4 offers, like the other procedures, a choice between fully automatic protection and precedence of teleo-typified species and generic names published before D (Procedure 4A) and a selective protection or precedence of teleo-typified or ana-typified species and generic names (Procedure 4B). Anamorph names of unconnected taxa published before D retain their anamorphic application. When they are found to be connected to a teleomorph, the name of which is published before or after D, one or the other mechanism of protection will play, depending on the choice between Procedures 4A or 4B.

NEW RULES SHOULD DECLARE

PROCEDURE 4A (Figs. 3, 4, 5)

- (1) Repressed and not available for use: **anamorph epithets** published *before D* for species and infraspecific pleomorphic taxa connected to a named teleomorph published *before* or *after D*. The repressed epithets are anamorphic synonyms ("*nom. repr.*") of the name of the teleomorph. They remain legitimate and can be restored if the ana-tele connection is demonstrated to be erroneous. Teleo-typified epithets published before D are protected against connected anamorph epithets.

The combination of an anamorph epithet published *before D* (being of restricted anamorphic application) with any teleo-typified holomorph-generic name published *before or after D* is regarded as a formal error (as in present Art. 59.6), but can be regarded as the name of a new taxon, if the conditions for such an introduction are fulfilled.

- (2) Accepted and available for use: **anamorph epithets** published *before D* for species and infraspecific taxa with restricted anamorphic application (Art. 59.3), as long they are not connected to a teleomorph.

The combination of an anamorph epithet published *before D* with an ana-typified holomorph-generic name introduced *after D* is legitimate, but the resulting binomial remains of restricted anamorphic application by virtue of its type (Art. 59.3 second sentence).

- (3) Ana-typified **epithets** published *after D* apply to holomorphs. New ana-typified holomorph epithets may not be introduced *after D* for an anamorphic fungus of which an anamorph is already named *before D*. But a new ana-typified or teleo-typified holomorph epithet can be introduced for an anamorphic fungus named before D and found teleo-connected, if no holomorph epithet is available.

The combination of an ana-typified epithet published *after D* with a teleo-typified generic name published *before or after D* is legitimate, if no prior epithet is available for the newly found teleo-connected fungus.

- (4) Having precedence: **teleo-typified generic names** published *before D* with holomorphic application (Art. 59.1-2) over correlated anamorph-generic names published *before D*.
- (5) Accepted and available for use: **anamorph-generic names** published *before D* which retain restricted anamorphic application by virtue of their anamorphic type, even if they are correlated to a teleo-typified generic name by their type or another teleo-connected species; their anamorph name is then repressed without competing with a generic name of the teleomorph published *before or after D*. When superseded, the anamorph name is not a true but an anamorphic synonym of the correlated teleomorph-generic name. Superseded names remain legitimate and available to accommodate unconnected anamorphic species.

The teleomorph name of the species is to be used for the formal designation of the teleo-connected type or other species of a correlated anamorph generic name. The anamorph of a named teleomorph species can be informally addressed in cross-reference form.

- (6) **Ana-typified generic names** published *after D* apply to holomorphs. When their type species is found connected with a teleomorph, the name will compete for priority with any teleo-typified generic name published after D.

When an ana-typified generic name published *after D* is found correlated with a teleo-typified generic name published *before D* by their ana-teleo-connected type species, the younger generic name is synonymized with the earlier generic name. If those generic names are correlated by any non-type

species only, the species may be transferred to their best taxonomic position.

- (7) *Protected and available for use: **anamorph epithets of pleoanamorphic fungi** published before D, if selected for either being the most commonly used, or the most representative, or the earliest, against other epithets of correlated anamorphs published before D, which are explicitly repressed and not available for use (e.g., a name for conidiomata to be protected over names for spermatia or sclerotia). The repressed epithets remain legitimate and should be cited as anamorphic synonyms ("nom. repr."). They can be restored when the synanamorphic connection is demonstrably erroneous. When a particular epithet is selected and retained as the correct name, according to priority or not, the epithets of correlated anamorphs are not considered as taxonomic synonyms but only as anamorphic synonyms.*

- (8) *Protected and available for use: **anamorph epithets of pleoanamorphic fungi** published before D against holomorph epithets published after D for a correlated anamorph of the same fungus, in the absence of any connection with a teleomorph.*

This implies that no new ana-typified epithet may be introduced after D for a correlated anamorph of a pleoanamorphic fungus of which another anamorph already bears an epithet published before D, unless the fungus is found connected to an unnamed teleomorph. When an ana-typified holomorphic epithet is published after D for a taxon that is later found connected to an already named anamorph before D, the earlier name is obviously the correct name with holomorphic application.

- (9) *Accepted and available for use: **anamorph-generic names of pleoanamorphic fungi** published before D and typified by a type species connected to a named correlated anamorph, the epithet of which is repressed according to (7). These generic names remain legitimate and available for use. Their type and other ana-connected species can be addressed by their correct name or informally in cross-reference form.*

Such cross-reference designation using ana-typified generic names published after D would be meaningless as the ana-typified generic names are then of holomorphic application.

- (10) *New ana-typified generic names may not be introduced after D for a correlated anamorph of a pleoanamorphic fungus of which a correlated anamorph is already named before D, unless the generic name is needed to accommodate other new species.*

PROCEDURE 4B

- (1) *Protected and available for use: **teleo-typified epithets** of pleomorphic fungi published before D, unless an anamorph epithet of the same fungus published before D is selected for protection as being the most representative or commonly used, if not the earliest name of the taxon, in which case the teleo-typified epithet is repressed and the protected ana-typified epithet assigned holomorphic application. Repressed names are anamorphic or teleomorphic synonyms to be cited as *nomen repressum* ("nom. repr.") of the correct name. Repressed names remain legitimate and are restorable for use when the organic connection is demonstrably erroneous. Protected and repressed names are published in a revisable approved list. Anamorphs of pleomorphic fungi can be addressed, informally, in cross-reference form.*

The combination of an anamorph epithet published before D (being of restricted anamorphic

application) with any teleo-typified holomorph-generic name published *before or after D* is regarded as a formal error (as in present Art. 59.6), but can be regarded as the name of a new taxon, if the conditions for such an introduction are fulfilled, unless the anamorph epithet is protected and assigned holomorphic application.

- (3) As above.
- (4) Having precedence: **teleo-typified generic names** of pleomorphic fungi published before D with holomorphic application, unless a correlated anamorph-generic name is selected as being the most representative or commonly used if not the earliest generic name, for protection against a teleo-typified generic name and for precedence over correlated anamorph-generic names to be used with holomorphic application. Repressed teleomorph-generic names remain legitimate and restorable when the connection is demonstrably erroneous. Superseded anamorph-generic names remain legitimate and available for use with restricted anamorphic application. Repressed and superseded generic names are to be published in a revisable approved list.

It is clear that the exceptional selection of an anamorph-generic name is an infringement on the principle of the procedure strictly applied in option A and to the mechanism of precedence/restriction, as it must invoke protection/repression against competing teleo-typified generic names.

Rules (5) to (10) of Procedure 4A remain valid.

COMMENTS

- 1) The proposed rules (3) and (10) implicitly prohibit, in respect of Principle IV of the *Code*, the introduction of holomorphic epithets or generic names in place of the unconnected pre-D anamorph names. The epithets or generic names are typified by the same anamorph, although they are not true synonyms, being of different application. When an epithet or generic name is published after D for an anamorphic fungus, although the same fungus has an earlier epithet or generic name published before D, the older name is retained, as long as the taxon is not found connected to a teleomorph.

The rules (3) and (10) seem necessary to avoid renaming after D all anamorphic fungi that had been named before D, in order to provide names with holomorphic application.

However, under Procedure 4, anamorph epithets published before D are not equivalent to ana-typified epithets published after D. For a single anamorph, *as for distinct anamorphs of pleoanamorphic fungi*, the pre-D name is of restricted anamorphic, the after-D name of holomorphic application. Therefore they are not true synonyms and priority is not at play.

Furthermore, these rules implicitly provide protection to anamorph epithets of pleoanamorphic fungi published before D against additional ana-typified names published after D.

- 2) Procedure 4 in its principle most strongly resembles the proposals made by Hawksworth (*in litt.* 2001, see this website). An analysis is needed to appreciate the differences if there are any.

Hawksworth's proposals aim at returning to the strict application of the one-organism--one-name principle in the fungi by: "(1) restricting the application of the current Art. 59.1 to 59.6 to names published before D; (2) utilizing teleomorph epitypes to fix the interpretation of names typified by anamorphic material only

when teleomorphs are subsequently discovered; and (3) recommending the informal use of generic names to indicate anamorphs for all pleomorphic fungi, including those published before D."

To return to the strict application of the one-organism--one-name principle, the proposal limits the application of the present Art. 59, particularly Art. 59.1 to 59.6 inclusive, up to date D, and provides a new Art. 59.7 to warrant a botanical (holomorphic) system of nomenclature from D onwards. This is exactly the principle of Procedure 4.

Strangely, Art. 59.4 and 59.5 are maintained in Hawksworth's proposals which attribute precedence to teleo-typified names (not protection/repression) and allow the use of separate anamorph names of pleomorphic fungi. We suppose this to be a *lapsus calami*. Indeed, Hawksworth proposes a new Art. 59.8 and new recommendations 59.A1 and 59.A2 and examples which recommend the use of informal designations of anamorphs in holomorphic fungi, such as a cross-reference designation using pre-D anamorph-generic names together with the correct holomorphic name. It might possibly imply that those anamorph-generic names cannot be used in separate binomials. But that is not certain. Indeed, the new Art. 59.7 proposed by Hawksworth prevents the use of separate binary names in pleomorphic fungi published after D, a rule that apparently does not affect names published before D.

What treatment should be applied to multiple names of pleoanamorphic fungi published before D? This question is not treated in the proposal. The case where pleoanamorphic fungi with anamorph names published before D are found connected with anamorphs that received an ana-typified holomorphic name after D, is also not foreseen in the proposal.

The contents of the new Art. 59.8 of Hawksworth concerning the informal designation of anamorphs of pleomorphic fungi, is somewhat redundant with the new Rec. 59A.1 and 59A.2 and Examples, and should not be considered as a distinct rule but reduced to a recommendation.

The new Art. 59.7 of Hawksworth proposes that "For names published after D, the correct name covering the holomorph is the earliest legitimate name whether typified by an element representing the teleomorph or the anamorph" and consequently with holomorphic application, while for names published before D the proposal retains Art. 59.1-6, i.e. anamorph names with anamorphic application.

Although apparently simple, the wording of Art. 59.7 of Hawksworth reveals ambiguities, and the coexistence with Art. 59.1--6 will cause some problems. Which name can be the "*earlier* legitimate name" indicated in Art. 59.7? Could it be a name published before D or not? Also, the new Art. 59.7 Note 2, applicable to names published after D and proposing the use of an epitype "where a teleomorph has been discovered for a fungus *hitherto* known only as an anamorph" shows the same ambiguity as the word "earlier". The need of introducing a teleomorphic epitype would imply that the original type is anamorphic with an available earlier legitimate anamorph name. When should this name have been published in order to be considered: before D as anamorphic name or after D as ana-typified name of holomorphic application? As the extant Art. 59.3 regulating names published before D prevents holomorphic application of anamorph names and Art. 59.6 prevents the combination of an anamorph epithet with a holomorph-generic name, the proposal apparently for ever precludes all anamorph names (epithets and generic names) published before D from a possible holomorphic application even when supported by an epitype. It appears also contradictory with the second sentence of the new Art. 59.7 of Hawksworth "Separate binary names ... for teleomorphs

where the anamorph is named, published after that date ..., are illegitimate". If this sentence refers to earlier anamorph names published before D, using them in holomorphic application for teleomorphs, recombined or not, would indeed contradict Art. 59.3 and 59.6.

Similar problems of coexistence of anamorph- and ana-typified holomorph- epithets and generic names exist in Procedure 4. The problems can be addressed in four other, different ways.

- (a) Anamorph epithets and generic names published after D, like those published before D, are excluded for ever from holomorphic application, meaning that they are repressed when alternate names of holomorphs are published before or after D, or they remain anamorphic when not teleo-connected (Procedure 1A).
- (b) Anamorph epithets and generic names published before D, like those published after D, and they are available as the correct names for the holomorph even when teleo-connected unless prior to a competing teleomorph names published before D (Procedure 2A).
- (c) All anamorph epithets and generic names published before D, like those published after D, are assigned holomorphic application, if they are not repressed as alternate names for pleomorphic fungi published before D, while ana-typified generic names published before or after D remain restrictedly anamorphic, thus never available for holomorphs. The combination of holomorphic epithets with anamorphic generic names is ruled by Art. 59.3 (Procedure 3A).
- (d) All anamorphic epithets published before D, like those published after D, are assigned holomorphic application, if they are not repressed as alternate names for pleomorphic fungi published before D while ana-typified generic names published before D only remain restrictedly anamorphic like in Procedure 4 (Procedure 5A).

Here the problem remains in the coexistence of anamorph- and ana-typified holomorph- generic names, the former being unavailable and the latter being available for holomorphs, while it is resolved at specific level.

This last procedure would be another interpretation of Hawksworth's proposals, where the expression "earlier legitimate name" in his new Art. 59.7 would easily apply to ana-typified names published before D when assigned holomorphic application.

This last procedure would be another interpretation of Hawksworth's proposals, where the expression "earlier legitimate name" in his new Art. 59.7 would also apply to ana-typified names published before D when assigned holomorphic application.

FORMAL PROPOSALS

CHAPTER VI new title: "Names of non-lichen-forming ascomycetous and basidiomycetous fungi."

TYPE DEFINITION

- 1) In Art. 7.2 after "of a taxon" insert "or an anamorphic or teleomorphic element of fungi (for names of ascomycetous and basidiomycetous fungi published before [D], see Art. 59)."
- 2) In Art. 7.9 Note 1 after "pleomorphic" insert "and pleoanamorphic".

DUAL NOMENCLATURE

3) In Art. 11.1 delete "for the form-taxa of fungi and" and "and 59.5".

TYPES IN HIGHER FUNGI

4) In Art. 59.1 after "(teleomorph)" insert "prior to [D]", after "representing the teleomorph" delete "i.e. the morph ... organs." and insert "unless another name published before [D] is explicitly protected as the correct name (Art. 59.4). Names of still uncorrelated specific and infraspecific taxa published before [D] are of strictly anamorphic application (Art. 59.2). Names of genera published before [D] and typified by an anamorph, no matter whether their type species is pleomorphic, pleoanamorphic or not, are restricted in application to the anamorph represented by their type, [add under 3B:] unless the generic name is assigned precedence or protection and holomorphic application] (Art. 59.4bis). For names of new taxa published after [D], the correct name covering the holomorph is the earliest legitimate name published, no matter whether typified by an element representing the teleomorph or the anamorph.

5) In Art. 59.2 after "binary name" insert "of pleomorphic fungi published before [D]" and after "teleomorphic" insert "i.e. characterized by ... organs." from Art. 59.1. Add to this paragraph the first sentence of 59.3: "If these requirements ... protologue."

APPLICATION OF NAMES IN GENERA

6) In Art. 59.3 delete the first sentence now in Art. 59.2 and in the second sentence after "author's" insert "typified by a teleomorph or an anamorph."

STATUS OF SPECIES NAMES PUBLISHED BEFORE [D]

7) Replace Art. 59.4 by new Art. 59.4: "Irrespective of priority, names published before [D] typified by a teleomorph are protected as the correct names covering the holomorph, [add under Procedure 4B:] unless a name typified by a correlated anamorph is selected as being the most representative or commonly used, and explicitly protected] against earlier names typified by a correlated anamorph; the latter names are repressed, as long as the types are judged to belong to the same taxon."

"Amongst names of correlated anamorphs of pleoanamorphic fungi published before [D], one name is to be selected as the most representative or commonly used if not the earliest, and explicitly protected against the other names which are repressed, as long as the types are judged to belong to the same taxon."

"Repressed names are cited in synonymy as *nomen repressum* ("*nom. repr.*"); they are legitimate and remain available when demonstrably typified by a different taxon. Protected and repressed names are to be published in a revisable approved list."

PRECEDENCE OF GENERIC NAMES PUBLISHED BEFORE [D]

8) Introduce new Art. 59.4bis: "Names of genera published before [D] typified by a teleomorph take precedence as the correct holomorph-generic names over earlier superseded names of genera typified by a correlated anamorph, [add under Procedure 4B:] unless a generic name typified by a correlated anamorph

is selected as the most representative or commonly used, if not the earliest, and explicitly protected against the generic name typified by the teleomorph, which then is repressed], as long as the types are judged to belong to the same taxon."

"The names of genera published before [D] typified by an anamorph of a pleoanamorphic taxon, selected as the most representative or commonly used, if not the earliest name, take precedence over other names of genera typified by a correlated anamorph; the latter names are superseded, as long as the types are judged to belong to the same taxon". "Superseded generic names, and other names of genera published before [D] typified by an anamorphic species, are legitimate and available for use, in restricted application to the morph represented by their ultimate type. [Add under Procedure 4B:] Repressed teleomorph-generic names remain legitimate and restorable for use when the connection between morphs is demonstrably erroneous."

PREVENTION OF DUAL NAMES

9) Replace Art. 59.5 and Examples by new Art. 59.5: "The introduction of separate binary names after [D] for anamorphs when the teleomorph or a correlated anamorph is already named, or for teleomorphs when the anamorph is named, is illegitimate and to be rejected as superfluous when homotypic or incorrect as synonym when heterotypic.

CITATION OF TYPE SPECIES

10) Replace Note 1 by new Note 1: "The type species of anamorph-generic names published before [D], the binary name of which is repressed, is to be cited by its correct name (see also Rec. 59A.1).

NEW COMBINATIONS

11) In Art. 59.6 after "introduction" insert "before or after [D]" and after "purported basionym" insert "published before [D]". Ex 6. is correct. The other examples should be amended or deleted.

DESIGNATION OF EPITYPE

12) Insert a new Note 2 after Art. 59.6: "If a new teleomorph is discovered for a fungus hitherto known only as an anamorph with a name published before [D], the teleomorph is to be described as a new species with its own type also after [D]. When an anamorph published after [D] is subsequently found to belong to a teleomorphic fungus, the name applies to the holomorph and an epitype with the teleomorph may be designated to fix the application of the name."

CROSS-REFERENCE CITATION OF ANAMORPHS

13) Delete Rec. 59A.1, 59A.2 and 59A.3.

14) Introduce new Rec. 59A.1: When it is considered desirable to specifically refer to the anamorph with no legitimate name published before D or connected to a teleomorph named before or after [D], it can be denominamed informally using the Latin generic names of an anamorph, provided that these generic names were published prior to [D], or preferably using the same name in a decapitalized form or any common name like "anamorph" or "conidial state" ("anam." or "con. st.").

15) Introduce a new Ex. 59A.1: "The *Stemphylium* anamorph of *Pleospora herbarum* (Fr.) Rabenh. ex Ces. & De Not. 1863 should be informally referred to as: *Pleospora herbarum* (*Stemphylium* anamorph), *P. herbarum* (*stemphylium* state), *Stemphylium* state of *P. herbarum*, *stemphylium* state of *P. herbarum*, anamorph of *Pleospora herbarum*, etc., rather than as *Stemphylium herbarum* E.G. Simmons 1986."

PROCEDURE 5

Principle: All epithets, whether typified by a teleomorph or anamorphic material published before or after D, are to be considered as of holomorphic application, retroactively back to the starting-point of the taxonomic group concerned. Names of genera based on an anamorphic type published before D retain restricted anamorphic application and are available for the classification of anamorphic fungi. All generic names published after D are of holomorphic application and available for the generic denomination of holomorphs.

Procedure 5, like Procedures 2, 4 and 6 (Fig. 2, 3) assigns holomorphic application to all names introduced *after D*, obeying the principle of one organism--one name.

Like Procedures 2, 3 and 6, Procedure 5 retroactively assigns holomorphic application to all anamorphic epithets published *before D*, with similar mechanisms of protection and repression in the alternatives 5A or 5B. Like Procedures 1, 3 and 4, Procedure 5 retains all anamorph-generic names, but only those published before D remain with restricted anamorphic application, available for anamorphic fungi or informal designation of anamorphs of pleomorphic fungi.

Mechanisms of protection/repression of epithets published before D are to be adopted, like in the other Procedures, either automatically (5A) or selectively (5B).

Precedence of teleo-typified holomorph-generic names published before D over anamorph-generic names published before D is granted in Procedure 5A, like in option A of other procedures; it allows the continued use of those anamorph-generic names with restricted application for unconnected taxa, unless an anamorph-generic name is exceptionally selected for protection and holomorphic application in procedure 5B. This selective protection goes together with the mechanism of precedence of generic names.

NEW RULES SHOULD DECLARE

PROCEDURE 5A (Fig. 4e)

(1) Repressed and unavailable for use: **ana-typified epithets** of teleo-connected species and infraspecific taxa when published prior to and competing with teleo-typified epithets of species published *before D* which are automatically protected. The repressed epithets are treated as taxonomic synonyms cited as ("*nom. repr.*"). They remain legitimate and are restorable for use when the ana-teleo connection is demonstrated erroneous.

Combinations made before D of anamorph epithets published *before D* with teleo-typified pre-D

generic names for pleomorphic fungi remain ruled by Art. 59.6.

The ana-typified synonyms are inappropriate for the specific designation of the anamorph of a teleomorphic species, all ana-typified epithets being of holomorphic application in this procedure.

- (2) Accepted and available for use: **ana-typified epithets** of species and infraspecific taxa published *before and after D*, for denomination of anamorphic species or when teleo-connected in the absence of a teleo-typified name published *before D* and prior to other available epithets published *after D* for addressing teleomorphic holomorphs.

All ana-typified epithets, being of holomorphic application, obey the priority rule unless they are found to be teleo-connected and repressed by a protected teleo-typified epithet published *before D*.

Combinations of ana-typified holomorph epithets with anamorph-generic names published *before or after D* are legitimate but receive holomorphic application by virtue of the new Art. 59.3 second sentence.

Combinations of anamorph epithets with teleo-typified generic names made before D remain regulated by Art. 59.6. *After D*, combinations of unrepressed ana-typified holomorph epithets published *before D* with teleo-typified generic names published before or after D are legitimate; the anamorph can be specifically informally designated by cross-reference using the anamorph-generic name.

- (3) Having precedence and available for use: **teleo-typified generic names** published *before D* over correlated anamorph-generic names published *before D* which are superseded but remain legitimate and available for unconnected species even when their ana-typified type species is teleo-connected and its epithet therefore is repressed. Teleo-connected type species of anamorph genera are to be cited with their correct holomorph name in a cross-reference form.
- (4) Accepted and available for use: **anamorph-generic names** published *before D*, being of restricted anamorphic application defined by their anamorphic type, for unconnected anamorphic species published before or after D, although their ana-typified species and other species epithets are of holomorphic application and even if the type or another species is teleo-connected and its epithet repressed.

Anamorphs of teleo-connected species can be addressed specifically and informally in cross-reference form using the anamorph-generic name if published before D or preferably the same in a decapitalized form or any common name like "anamorph of ...", "conidial state of ..." <their correct holomorph name>.

- (5) Accepted and available for use: **all generic names** published *after D*, being of holomorphic application, no matter whether their type is anamorphic or teleomorphic, for the denomination of holomorphs.

When a ana-typified holomorphic generic name published *after D* is found connected with a teleo-typified generic name published *before D* by its type species, the younger generic name is synonymized with the earlier generic name. If those generic names are correlated by any non-type species only, the species may be transferred to their best taxonomic position.

Ana-typified generic names published *after D* cannot serve for the specific designation of the anamorph of teleomorphic holomorphs in cross-reference form. Only common terms are then available.

- (6) *Protected and available for use: ana-typified epithets of pleoanamorphic fungi published before D, selected for being either the most commonly used, or the most representative, if not the earliest*

(normally priority plays) against epithets of correlated anamorphs that are repressed and not available for use (e.g., a name for conidiomata to be protected over names for spermatia or sclerotia). Repressed epithets are taxonomic synonyms and remain legitimate and restorable for use when the organic connection is ostensibly erroneous. Repressed names are to be published in a revisable approved list.

Epithets of correlated anamorphs published after D of an already named species are incorrect and regarded as taxonomic synonyms.

- (7) Accepted and available for use: **anamorph-generic names of pleoanamorphic fungi** with restricted anamorphic application, no matter whether the epithet of their type species is protected or repressed.

PROCEDURE 5B

- (1) Protected and available for use: **teleo-typified epithets** of pleomorphic fungi published *before* D, unless an anamorph epithet of the same fungus is selected for protection as being the most representative or commonly used if not the earliest name of the taxon, in which case the teleo-typified epithet is repressed and the protected ana-typified epithet received holomorphic application. Repressed names are taxonomic synonyms to be cited as *nomen repressum* ("*nom. repr.*") of the correct name. Repressed epithets remain legitimate and can be restored when the organic connection is demonstrably erroneous. Protected and repressed names are published in a revisable approved list.

Anamorphs of pleomorphic fungi can be addressed, informally, in cross-reference form using the Latin or decapitalized anamorph-generic name if published before D or otherwise by paraphrasing and using terms like "anamorph of <correct name>".

- (2) as above.
- (3) Having precedence: **teleo-typified generic names** of pleomorphic fungi published before D with holomorphic application, unless a correlated anamorph-generic name is selected as being the most representative or commonly used if not the earliest generic name, for protection against correlated teleo-typified generic names and for precedence over correlated anamorph-generic names, available for use with holomorphic application. Repressed teleomorph-generic names remain legitimate and are restorable when the connection is demonstrably erroneous. Superseded anamorph-generic names remain legitimate and available for use with restricted anamorphic application. Repressed and superseded generic names are published in a revisable approved list.

It is clear that the exceptional selection of an anamorph-generic name is an infringement on the principle of the procedure strictly applied in option A and to the mechanism of precedence/restriction, as it must invoke protection/repression against competing teleo-typified generic names.

Rules (4) to (7) of Procedure 5A remain valid.

COMMENTS

Procedure 5 differs from Procedure 4 and Hawksworth's proposals in the retroactive extension of the holomorphic application of types of ana-typified epithets published before D, allowing their use in holomorphic combinations introduced after D if teleo-connected, but leaving all names of pleomorphic fungi

established before D unchanged in adherence to Art. 59.6. Like Procedure 4 and Hawksworth's proposals, Procedure 5 retains all ana-typified generic names published before D as anamorph-generic names, i.e. with restricted anamorphic application, even if their type species is teleo-connected. Anamorph-generic names published before D can therefore not compete with other generic names.

This procedure resolves the difficulties encountered when recombining ana-typified epithets into holomorphic genera, considering all epithets of holomorphic application. Procedure 4 and Hawksworth's proposals retain ana-typified epithets published before D in their restricted anamorphic application as anamorph epithets, and treat their recombinations in holomorphic genera as incorrect, as ruled by Art. 59.6. This effect is here suppressed retroactively.

FORMAL PROPOSALS

CHAPTER VI new title: "Names of non-lichen-forming ascomycetous and basidiomycetous fungi."

TYPE DEFINITION

- 1) In Art. 7.2 after "of a taxon" insert "or an anamorphic or teleomorphic element of fungi, including the non-lichen-forming ascomycetous and basidiomycetous fungi."
- 2) In Art. 7.9 delete "anamorphs)" and insert "anamorph genera"; in Note 1 after "pleomorphic" insert "and pleoanamorphic".

DUAL NOMENCLATURE

- 3) In Art. 11.1 delete "for the form taxa of fungi and" and "and 59.5".

TYPE IN HIGHER FUNGI

- 4) In Art. 59.1 after "legitimate name" delete "typified ... organs." and insert "no matter whether it is typified by an element representing the teleomorph or the anamorph, unless another name of the same fungus published before [D] is protected as the correct name (Art. 59.4). Names of genera published before [D] and typified by an anamorph, even if their type species is pleomorphic or pleoanamorphic, are restricted in application to the anamorph represented by their type, [add under Procedure 5B:] unless the generic name is explicitly assigned protection and holomorphic application (Art. 59.4bis).]" Delete Ex. 1.
- 5) In Art. 59.2 after "binary name" insert "of pleomorphic fungi published before [D]" and after "teleomorphic" insert "i.e. characterized by ... organs." from Art. 59.1. Add to this paragraph the first sentence of present Art. 59.3: "If these requirements ... protologue."

APPLICATION OF NAMES IN GENERA

- 6) In Art. 59.3 the first sentence was transferred to Art. 59.2; in the second sentence after "author's" insert "typified by a teleomorph or an anamorph."

PROTECTION OF SPECIES NAMES PUBLISHED BEFORE [D]

7) Replace Art. 59.4 by new Art. 59.4: "Irrespective of priority, names published before [D] typified by a teleomorph are protected as covering the holomorph, against earlier names typified by a correlated anamorph, [Under Procedure 5B:] unless a name typified by a correlated anamorph is selected as the most representative or commonly used and explicitly protected against competing names typified by a correlated teleomorph]; the latter names are repressed, as long as the types are judged to belong to the same taxon."

"Amongst names of correlated anamorphs of pleoanamorphic fungi published before [D], one name is to be selected and explicitly protected as the most representative or commonly used, even if not the earliest, against other names that are repressed, as long as the types are judged to belong to the same taxon."

"Repressed names are cited in synonymy as *nomen repressum* ("*nom. repr.*"); they are legitimate and remain available when demonstrably typified by a different taxon. Protected and repressed names are published in a revisable approved list."

PRECEDENCE OF GENERIC NAMES PUBLISHED BEFORE [D]

8) Introduce new Art. 59.4 bis: "Names of genera published before [D] typified by a teleomorph take precedence as the correct holomorph-generic names over earlier names of genera typified by a correlated anamorph, [Under Procedure 5B:] unless a generic name typified by a correlated anamorph is selected as being the most representative or commonly used, if not the earliest, and explicitly protected against a generic name typified by the teleomorph which is repressed.]"

"Names of genera published before [D] typified by an anamorph of a pleoanamorphic taxon, selected as the most representative or commonly used, if not the earliest, take precedence over other names of genera typified by a correlated anamorph."

"Superseded generic names, and other names of genera published before [D] typified by an anamorphic species, remain legitimate and available for use, in restricted application to the morph represented by their ultimate type. [add under Procedure 5B:] All kinds of repressed names remain legitimate and restorable for use when the connection between morphs is demonstrably erroneous."

PREVENTION OF DUAL NAMES

9) Replace Art. 59.5 and Examples by new Art. 59.5: "Introduction of separate binary names after [D] for anamorphs when the teleomorph or a correlated anamorph is already named, or for teleomorphs if the anamorph is named, is either illegitimate as being superfluous when homotypic, or incorrect as creating a synonym when heterotypic."

CITATION OF TYPE SPECIES

10) Replace Note 1 by new Note 1: "If the epithet of the type species of an anamorph generic name published before [D] is repressed, this species is to be cited by its correct name (see also Rec. 59A.1).

NEW COMBINATIONS

11) Maintain Art. 59.6 and insert at the beginning "For names of pleomorphic fungi published before [D],".

12) Introduce new Art. 59.6bis: "After [D], the combination of earlier specific or infraspecific epithets

published before [D], typified by an anamorph, covering the holomorph in accordance with Art. 7.2 and found connected to a teleomorph, with a teleomorph typified generic name is legitimate, when the requirements for valid publication of a new combination (Arts. 33 and 34) and in respect of Art. 59.2 to 59.5 have been fulfilled."

DESIGNATION OF EPITYPES

13) Introduce new Note 2 after Art. 59.6bis: "When a teleomorph has been discovered for a fungus hitherto known only as an anamorph, the name of the anamorph, even if published before [D], applies to the holomorph and an epitype containing the teleomorph is to be designated to fix the application of the name".

INDICATION OF RANK

14) Delete Rec. 59A. 1 and 59A.2.

CROSS-REFERENCE CITATION OF ANAMORPHS

15) Delete Rec. 59A.3 and introduce new Rec. 59A.1: "When it is desirable to specifically refer to an anamorph of an otherwise correctly named fungus, this is to be designated informally using either the Latin generic name of the anamorph, if published prior to [D], or preferably the same in a decapitalized form or any common name like "anamorph of ...", "conidial state of ..." (in brief "anam." or "con. st.").

16) Add a new Ex. 59A.1: The *Stemphylium* anamorph of *Pleospora herbarum* (Fr.) Rabenh. ex Ces. & De Not. 1863 should be informally referred to as: *Pleospora herbarum* (*Stemphylium* anamorph), *P. herbarum* (stemphylium state), *Stemphylium* state of *P. herbarum*, stemphylium state of *P. herbarum*, anamorph of *Pleospora herbarum*, etc., rather than as *Stemphylium herbarum* E.G. Simmons 1986.

PROCEDURE 6

Principle: All epithets, whether typified by a teleomorph or anamorphic material published before or after D, are to be considered as of holomorphic application, retroactively back to the starting-point of fungal nomenclature. Names of genera based on anamorphic types are of holomorphic application and available for the generic denomination of holomorphs, except for names of anamorph genera published before D of which the type species is connected to a teleomorph named before D; the latter names remain available but with restricted anamorphic application.

Procedure 6, like Procedures 2--5 (Fig. 2, 3), declares all epithets introduced *after D* of holomorphic application and, like Procedures 2, 3 and 5, it retroactively assigns holomorphic application to all anamorph typified epithets published *before D*. It complies with principle IV of the *Code*, one organism--one name, by the free play of priority amongst epithets.

Like Procedures 2, 4 and 5, but not Procedure 1 or 3, Procedure 6 also assigns holomorphic application to generic names published *after D*, no matter whether the type is anamorphic or teleomorphic. But unlike Procedures 3--5, Procedure 6 extends holomorphic application to all generic names published *before D* even

if typified by an anamorph.

At this point, Procedure 6 would be identical to Procedure 2, but it differs in its options A and B by assigning precedence/restriction, rather than protection/repression, to teleo-typified generic names for pleomorphic fungi over competing ana-typified generic names published *before D*. The competing ana-typified generic names are reduced to strictly anamorphic application and are available for ana-typified unconnected species.

The two mechanisms of protection and precedence of names in pleoanamorphic fungi are needed in Procedure 6, like in others, to eliminate dual nomenclature with a minimum of destabilization. For the same reasons as expressed before, one can opt for applying these mechanisms automatically or selectively in the alternative Procedures 6 A and 6B.

NEW RULES SHOULD DECLARE:

PROCEDURE 6A (Figs. 3, 4, 5)

- (1) Repressed and unavailable for use: **ana-typified epithets** of teleo-connected species and infraspecific taxa when prior to and competing with teleo-typified epithets of species published *before D* which are automatically protected. The repressed epithets are taxonomic synonyms ("*nom. repr.*") and remain legitimate and restorable for use if the connection is demonstrably erroneous.

Combinations made before D of a pre-D anamorph epithet with a pre-D teleo-typified generic name for pleomorphic fungi remains ruled by Art. 59.6.

- (2) Accepted and available for use: **ana-typified epithets** of species and infraspecific taxa published *before and after D*, for denomination of anamorphic holomorphs or, when teleo-connected, in absence of a teleo-typified epithet published before D and prior to other available epithets, for addressing teleomorphic holomorphs.

Ana-typified epithets, being of holomorphic application, obey the priority rule unless, for a teleo-connected fungus, a protected teleo-typified epithet published *before D* is available. When published after D, combinations of non-repressed ana-typified holomorph epithets published before D with teleo-typified generic names published before or after D are legitimate for the denomination of pleomorphic fungi.

- (3) Having precedence and available for use: **teleo-typified generic names** published before D over correlated ana-typified generic names, which are superseded and restricted anamorphic application. Superseded ana-typified generic names remain legitimate and available for unconnected species, even if their type or another species is connected to a teleomorph and their epithet repressed. Type species of teleo-connected superseded anamorph genera are to be cited by their correct holomorph name or in cross-reference form.
- (4) Accepted and available for use: **ana-typified generic names** published *before D*, being assigned holomorphic application, unless their type species is connected to a teleomorph the name of which is published before D.

Such ana-typified generic names, when accommodating ana-typified species found connected with an

undescribed teleomorph for which no appropriate generic name is available prior to D, can be emended by epitypification to accommodate such a pleomorphic species.

- (5) Accepted and available for use: **all generic names** published *after D*, no matter whether their ultimate type is an anamorph or a teleomorph, as being of holomorphic application, for generic denomination of holomorphs.

When an ana-typified generic name published after D is found to be correlated to a teleo-typified generic name published before D by its type species, the younger generic name is synonymized with the earlier one. If these generic names are correlated only by a non-type species, the species may be transferred to their best taxonomic position.

- (6) *Protected and available for use: **anamorph epithets of pleoanamorphic fungi** published before D, selected and explicitly protected for being either the most commonly used or the most representative, if not the earliest (priority is at full play), against any epithet for correlated anamorphs which are then automatically repressed and not available for use (e.g., a name for conidiomata to be protected over names for spermatia or sclerotia). Repressed epithets are taxonomic synonyms ("nom. repr.") but they remain legitimate and restorable if the connection is demonstrably erroneous.*

Epithets of correlated anamorphs published after D of an already named species are incorrect and regarded as taxonomic synonyms or illegitimate, being superfluous.

- (7) *Having precedence and available for use: **ana-typified generic names of pleoanamorphic fungi** published before D over correlated anamorph-generic names which are superseded. The superseded generic names remain available for unconnected species, even if their type species is ana-connected to a correlated anamorph and their epithet repressed.*

Type species of superseded ana-connected genera are to be cited by their correct name in informal cross-reference form.

PROCEDURE 6B

- (1) Protected and available for use: **teleo-typified epithets** of pleomorphic fungi published *before D*, unless an anamorph epithet of the same fungus is selected for protection as being the most representative or commonly used if not the earliest name of the taxon, in which case the teleo-typified epithet is repressed and the protected ana-typified epithet receives holomorphic application. Repressed names are taxonomic synonyms to be cited as *nomen repressum* ("nom. repr.") of the correct name. Repressed epithets remain legitimate and can be restored when the organic connection is demonstrably erroneous. Protected and repressed names are published in a revisable approved list.

Anamorphs of pleomorphic fungi can be addressed, informally in cross-reference form using the Latin or decapitalized anamorph-generic name if published before D or otherwise by paraphrasing and using terms like "anamorph of <correct name>".

- (2) as in Procedure 6A.
- (3) Having precedence: **teleo-typified generic names** of pleomorphic fungi published *before D* with holomorphic application, unless a correlated anamorph-generic name is selected as being the most representative or commonly used if not the earliest generic name, for protection against the correlated

teleo-typified generic name and for precedence over correlated anamorph-generic names, available for use with holomorphic application. Repressed teleomorph-generic names remain legitimate and restorable when the connection is demonstrably erroneous. Superseded anamorph-generic names remain legitimate and available for use with restricted anamorphic application. Repressed and superseded generic names are to be published in a revisable approved list.

(4) and (8) as in Procedure 6A.

It is clear that the exceptional selection of an anamorph-generic name is an infringement on the principle of the procedure strictly applied in option A and on the mechanism of precedence/restriction, making it necessary to invoke protection/repression against the competing teleo-typified generic name.

COMMENTS

- 1) Procedure 6 is closest to Procedure 2. The advantages of this procedure over Procedure 2 are (1) that it retains superseded ana-typified generic names of pleomorphic and pleoanamorphic fungi available for accommodating unconnected species, while in Procedure 2 ana-typified generic names are repressed and rendered unavailable, except for a few selectively protected names, and (2) it allows informal cross-reference names for anamorphs of pleomorphic or pleoanamorphic fungi using superseded anamorph-generic names with the correct name of the fungus, which is not possible under Procedure 2. In this respect, Procedure 6 is equivalent to Procedures 4 and 5.
- 2) In Procedures 3--5, including Hawksworth's proposals, the two systems of nomenclature, the anatomical one governed by extant but amended Art. 59, and botanical nomenclature, are mixed to a different extent, causing complex problems. Procedure 6 has the advantage over the others of reducing the interference of the anatomical system of nomenclature with botanical nomenclature to a minimum in space and time, at least after D. Unlike Procedures 4 and 5, Procedure 6 retroactively assigns holomorphic application to all names, epithets and generic names, which at the time D are not anamorph--teleomorph or anamorph--anamorph connected by their types. It therefore abolishes the nomenclatural distinction between anamorph and teleomorph names and removes their dual nomenclature.
- 3) As noticed in the Introduction, Chapter VI of the *Code* bear the heading "*Names of fungi with pleomorphic life cycle*" and only contains Art. 59. If this is taken literally, names of non-pleomorphic fungi, including all anamorphic fungi, should be treated botanically, i.e. with holomorphic application, no matter whether their type is anamorphic or teleomorphic. Art. 59 would become relevant only when fungi are found to be pleomorphic. Procedure 6 now exactly formulates this situation and specifies what names published before D are to be affected. In this regard, Procedure 6 appears to be an improvement over Hawksworth's proposal, in the sense that not only ana-typified epithets published before D are treated as holomorphic but also the ana-typified generic names published before D.

FORMAL PROPOSALS

CHAPTER VI new title: "Names of non-lichen-forming ascomycetous and basidiomycetous fungi."

TYPE DEFINITION

- 1) In Art. 7.2 after "of a taxon" insert "or an anamorphic or teleomorphic element of the fungi, including the non-lichen-forming ascomycetous and basidiomycetous fungi."
- 2) In Art. 7.9 delete "anamorphs" and insert "anamorph genera"; in Note 1 after "pleomorphic" insert "and pleoanamorphic".

DUAL NOMENCLATURE

- 3) In Art. 11.1 delete "for the form taxa of fungi and" and "and 59.5"

TYPE IN HIGHER FUNGI

- 4) In Art. 59.1 after "legitimate name" delete "typified ... organs." and insert "no matter whether typified by an element representing the teleomorph or the anamorph, unless another name of the same fungus published before [D] is protected as the correct name (Art. 59.4). Names of genera published before [D] typified by an uncorrelated anamorphic species are assigned holomorphic application (Art. 59.4bis). Names of genera published before [D] that are typified by an anamorph of a pleomorphic or pleoanamorphic species are restricted in application to the anamorph represented by their type, [add under Procedure 5B:} unless the generic name is explicitly assigned protection and holomorphic application (Art. 59.4bis).]" Delete Ex. 1.
- 5) In Art. 59.2 after "binary name" insert "of pleomorphic fungi published before [D]" and after "teleomorphic" insert "i.e. characterized by ... organs." from Art. 59.1. Add to this Art. the first sentence from 59.3: "If these requirements ... protologue."

APPLICATION OF NAMES IN GENERA

- 6) The first sentence of Art. 59.3 is transferred to Art. 59.2; in the second sentence after "author's" insert "typified by a teleomorph or an anamorph."

PROTECTION OF SPECIES NAMES PUBLISHED BEFORE [D]

- 7) Replace Art. 59.4 by new Art. 59.4:

"Irrespective of priority, names published before [D] typified by a teleomorph are regarded as the correct names covering the holomorph, protected against earlier names typified by a correlated anamorph, [add under Procedure 6B:} unless a name typified by a correlated anamorph is selected as being the most representative or commonly used and explicitly protected against earlier names typified by a correlated morph] the latter names are repressed, as long as their types are judged to belong to the same taxon."

"Amongst names of correlated anamorphs of pleoanamorphic fungi published before [D], one name is selected and explicitly protected as the most representative or commonly used if not the earliest, against other names that are repressed, as long as the types are judged to belong to the same taxon." "Repressed names are cited in synonymy as *nomen repressum* ("*nom. repr.*"); they are legitimate and remain available when demonstrated to be typified by a different taxon. Protected and repressed names are published in a revisable approved list."

PRECEDENCE OF GENERIC NAMES PUBLISHED BEFORE [D]

8) Introduce new Art. 59.4bis: "Names of genera published before [D] typified by a teleomorph take precedence as the correct holomorph-generic name over competing superseded generic names typified by a correlated anamorph, [add under Procedure 6B:] unless a generic name typified by a correlated anamorph is selected as being the most representative or commonly used, if not the earliest, and explicitly protected against the generic name typified by the teleomorph, which is repressed,] as long as the types are judged to belong to the same taxon."

"Names of genera published before [D] typified by an anamorph of a pleoanamorphic taxon, selected as the most representative or commonly used, even if not the earliest, take precedence over other names of genera typified by a correlated anamorph; the latter names are superseded, as long as the types are judged to belong to the same taxon." "Superseded generic names are legitimate and available for use, in restricted application to the morph represented by their ultimate type. [add under Procedure 6B:] Repressed teleomorph-generic names remain legitimate and restorable for use when the connection between the morphs is demonstrably erroneous."

PREVENTION OF DUAL NAMES

9) Replace Art. 59.5 and Examples by new Art. 59.5 as follows: "Introducing separate binary names after [D] for anamorphs when the associated teleomorph or a correlated anamorph is already named, or for teleomorphs when the anamorph is already named, is either illegitimate as superfluous when the names are homotypic, or incorrect as synonyms when they are heterotypic."

CITATION OF TYPE SPECIES

10) Replace Note 1 by new Note 1: "When the name of the type species of an anamorph generic name published before [D] is repressed, this species is to be cited by its correct name (see also Rec. 59A.1).

NEW COMBINATIONS

11) Retain Art. 59.6 and insert at the beginning "For names of pleomorphic fungi published before [D],".

12) Introduce new Art. 59.6bis: "After [D], earlier specific and infraspecific epithets typified by an anamorph, published before or after [D], covering the holomorph in accordance with Art. 7.2, when found to be connected to a teleomorph, may legitimately be combined with a generic name typified by a teleomorph, provided the requirements for valid publication of a new combination (Art. 33 and 34) and in respect of Art.59.2 to 59.5 are fulfilled."

DESIGNATION OF EPITYPES

13) Introduce new Note 2 after Art. 59.6bis: "Where a teleomorph has been discovered for a fungus hitherto known only as an anamorph, the name of the anamorph, even if published before [D], applies to the holomorph and an epitype containing the teleomorph is to be designated to fix the application of the name".

INDICATION OF RANK

14) Delete Rec. 59A. 1 and 59A.2.

CROSS-REFERENCE CITATION OF ANAMORPHS

16) Introduce new Rec. 59A.1: "When it is considered desirable to specifically refer to an anamorph of otherwise correctly named pleomorphic and pleoanamorphic fungi, this may be informally designated using the correct name and the Latin or decapitalized name of a superseded anamorph-generic name when published before [D], or common terms like "anamorph" or "conidial state" ("anam." or "con. st.") can be used. Such a designation only can use superseded anamorph-generic names, all other ana-typified names published before or after [D] being of holomorphic application.

17) Introduce new Ex. 59A.1: "The *Stemphylium* anamorph of *Pleospora herbarum* (Fr.) Rabenh. ex Ces. & De Not. 1863 should be informally referred to as: *Pleospora herbarum* (*Stemphylium* anamorph), *P. herbarum* (*stemphylium* state), *Stemphylium* state of *P. herbarum*, *stemphylium* state of *P. herbarum*, anamorph of *Pleospora herbarum*, etc., rather than as *Stemphylium herbarum* E.G. Simmons 1986.

CONCLUSIONS

The applicability of the *Botanical Code* to fungi was questioned for some years particularly because of Article 59 which permits secondary names for parts of a fungal organism, tolerating infringements on the basic Principle IV, one organism--one name; but it also infringes on Principle II of typification specified in Art. 7.2 and Principle III of priority specified in Art. 11. An amendment of Art. 59 enacted in 1977 at the Botanical Congress in Tampa, further reinforced these infringements. Since then, the idea has emerged of suppressing Art. 59 with dual nomenclature in the higher fungi, and to unify their nomenclature and to integrate their classification. These are two separate goals which are considered in this paper, and ways to reach them are discussed.

The way to each of these goals is paved with difficulties and fears. To unify the classification, authors have already pointed out:

- (1) The persisting lack of data on the ascial or basidial affinities of numerous deuteromycetes.
- (2) The non-correspondence of anamorphic genera with teleomorphic genera, because one or the other is polyphyletic or paraphyletic.
- (3) Even when correlated genera are monophyletic and particularly when they share the same type species, authors are reluctant to synonymize or merge them into one or the other, because of the uncertainty whether all morphically similar species really belong to the unified pleomorphic genus or whether they might preferably be classified in separate, and often differently delimited genera.
- (4) In many cases the organic connection between morphs is or may be questionable; also one of the correlated teleomorphic or anamorphic species can appear to be an aggregate or a complex species.

Considering these difficulties inherent to a unified taxonomy, the great fear arises of immersing nomenclature into chaos and losing its present relative stability. This is in fact the third difficulty mentioned

above, which is inherent to the process of integration. Any unification is likely to lead to numerous recombinations of species names as a consequence of synonymies of generic names. This may greatly disappoint practitioners who are accustomed to use separate anamorph names in sexual fungi, now threatened with disappearing. However, no definite and complete data base containing reliable sets of (dual) names of pleomorphic and pleoanamorphic fungi seems to exist, although several lists are already available. Only the careful analysis of such a data base will allow a reliable evaluation of the impact of any change of nomenclature; the extent of disturbance will depend on the procedure of integration adopted.

Up to now, three positions have been taken by mycologists in relation to the desired integration. On one side, the most conservative position advocates the *status quo*, maintenance of Art. 59 as it is, and dual nomenclature. On the opposite side, certain mycologists demand the abrupt deletion of Art. 59, the unification of nomenclatures, with some vague application of conservation mechanisms to preserve certain names. A third intermediate position has been recently taken by Hawksworth (*in litt.*, 2001; CBS website) that would retain the dual nomenclature with Art. 59 as it is, up to a certain date D, after which the Principles of Linnaean nomenclature will be strictly adhered to with a unique nomenclature for the higher fungi.

Analysing these positions and possible ways to reach the goals of integration of classification and nomenclature, we found that the fundamental key to integration is the conversion of anatomical typification of the higher fungi into botanical typification. This conversion can apparently be achieved to different extent. This led us to distinguish six scales of extending type application from the present anatomical to a fully extended botanical system. Consequently, six procedures of integration are described in this paper. The most far-reaching one attributes to all names of deuteromycetes holomorphic application and therefore makes them available for naming holomorphs.

Integration is not as simple as it seems because of the existence of alternate nomenclatures in pleomorphic fungi. Extending the botanical application of types means extending the action of priority amongst competing ana-typified and teleo-typified names for the same pleomorphic fungus. In many cases, competing binomials should be synonymized and if necessary newly recombined, at the expense of nomenclatural stability and to the disadvantage of practitioners. To alleviate this effect, we need mechanisms to save preferable names. The mechanisms of conservation or sanctioning are not appropriate, not being reversible when the organic connection between morphs is questioned.

In order to save desirable names, we propose two mechanisms, which are already implicitly used by the *Code*. The mechanism of protection/repression, underlying Art. 15.2, renders one of the alternate names protected and available for use, thus correct, the other repressed ("*nom. repr.*") and unavailable for use, although that name remains legitimate and restorable for use, should the condition of repression disappear. This mechanism is used here mainly at the specific and infraspecific ranks, thus for epithets. The other mechanism is that of precedence/restricted application, which is already in action in Art. 59 at both generic and specific-infraspecific ranks. This mechanism is used here only at the generic rank; it selects one name as the correct holomorph-generic name and reduces other generic names to restricted anamorphic application. These two mechanisms allow saving otherwise synonymized correlated (mostly anamorph-generic) names; they facilitate the integration of genera with a minimal number of necessary recombinations. All decisions about protection or precedence can be revised, when the organic connection between correlated taxa is ques-

tioned.

The two mechanisms can be applied according to two options. One option is the *fully automatic* application of protection/repression to preserve the presently dominating teleomorphic holomorph names. This option will mainly avoid confusion in the mind of taxonomists who are accustomed to the traditional 100-year-old concept of prevalence of the "perfect" over the "imperfect state" in the higher fungi. The other option is the *selective* application of protection/repression, taking up the most representative or the most frequently used names, if not the earliest, either anamorphic or teleomorphic. This option mainly complies with the practitioners' needs. Selective protection and precedence can be applied as an exception to the automatic mechanism. It evidently requires the detailed analysis of databases of names in dual nomenclature and the thoroughly documented and approved choice of the preferred name, which is to be documented in a published list; this selection must be revisable. Consequently, each of the six procedures of integration distinguished in this paper is presented with two options of automatic or selective protection/repression and precedence/restriction. The effect of applying these mechanisms in suppressing alternate names of pleomorphic fungi are similar, no matter which procedure is chosen.

Figures 2, 3 and 5 show the different extensions of the botanical (Linnaean, here holomorphic) application of nomenclatural types before and after the date D in the six procedures of integration. The procedures can be disposed in a progressive series, from Procedure 1, the most conservative, to Procedure 2 the most drastical, at either end of the series, and Procedures 3 to 6 in between (Fig. 3). Procedure 1 maintains anatomical application as ruled by present Art. 59, but suppresses alternate binomials in pleomorphic fungi by protection/repression of epithets and precedence/restriction of generic names. At the other end, Procedure 2 extends botanical application of names retroactively, accepting nevertheless protection/repression to eliminate alternate binomials and generic names in pleomorphic fungi.

Among the intermediate procedures (Figs. 2, 3, 5), Procedures 3--5 extend holomorphic application to all epithets of non-pleomorphic fungi, either retroactively or only if published after D, but they maintain anamorphic application of extant anamorph-generic names for ever, like in the present Art. 59. Procedure 6 closely approaches Procedure 2 in attributing holomorphic application to all epithets and generic names of non-pleomorphic Ascomycota and Basidiomycota retroactively. Procedure 6 differs from Procedure 2 in retaining anamorph genera of pleomorphic species in use for anamorphic fungi (Figs. 3, 5).

Each Procedure will lead to a uniform nomenclature and classification of the fungi from D onwards. In the end, the system of procedure 6 will be most similar to that used for the flagellate fungi, the Zygomycota, Glomeromycota and lichenized fungi. The only difference is in the restriction to anamorphic application of ana-typified generic names of pleomorphic fungi published before D, in agreement with their ultimate type and protologue, makes these generic names comparable to the numerous genera in the "lower fungi" which are defined by their asexual form. The only difference is that the circumscription of these correlated ana-typified genera cannot be modified to extend them to sexual species, while it is modifiable in the other non-correlated ana-typified genera of the higher fungi which are then assigned holomorphic application just like the "lower fungi".

We have to prepare ourselves to bring the change towards integration into practice. The ford between the present situation to that expressed by Procedures 2 or 6 is certainly uneasy to pass but it is not

impassable. It can be passed only when certain conditions are fulfilled. Besides the build-up and practical analysis of complete listings, we need for the higher fungi including the still anamorphic ones, a concept understanding and applying nomenclature in a way similar to that already in use for plants and lower fungi, where sexual and asexual taxa are treated at equal level. In that respect, when describing the procedures, we realize that Procedures 3 to 5, including Hawksworth's proposals, are mixing two systems of nomenclature, of course to a different extent; one anatomical is ruled by Art. 59, more or less drastically amended by the protection/repression mechanism, remaining applicable to a portion of names, while botanical nomenclature will rule the other portion of names of the same group. Working with such a mixed system is certainly an obstacle. Indeed, the various procedures can lead to nomenclaturally complex interactions in combination of names ruled by different systems. Only Procedure 2 entirely avoids the difficulty of mixing nomenclatural systems, repressing at the same time any alternate names. This is the least complex procedure. Procedure 6 almost avoids the difficulty restricting the application of the anatomical system (Art. 59) exclusively to extant pleomorphic fungi published before D, suppressing alternate names and leaving altogether a small number of anamorph-generic names -- including the most common ones -- in use as such, all other names being of holomorphic application, with the effect of greatly limiting nomenclatural disruption. Procedure 6 allows the classification of unconnected sexual and asexual species in different genera side by side with a possible transfer and recombination when they are demonstrated to be connected; this results in a situation comparable to that of the lower fungi.

In conclusion, we feel that it may be wise to take successive steps rather than to begin immediately with enacting one or the other of these procedures.

The first step will be a well-documented inventory of the nomenclature of pleomorphic and pleoanamorphic fungi, consisting of lists of alternate species names and of correlated generic names, as outlined in the comments on Procedure 1, in order to provide a clear picture of the situation. These lists will show the status of competing epithets and generic names of pleomorphic and pleoanamorphic fungi, allowing a well-founded choice of names to be subjected to protection/repression and, in parallel, to precedence/restriction. The listing will also indicate the number of unconnected species in respective correlated genera, facilitating an estimation of the numbers of necessary recombinations of names depending on the choice among the procedures. This first step of an inventory is an absolute prerequisite before undertaking further steps towards an integration of nomenclature.

In parallel, the inventory must include the classification of the pleomorphic species and their correlated genera in families or orders of the higher fungi. This will drastically demonstrate the lack of information about the classification of a bulk of the anamorphic and pleoanamorphic species. Extensive genomic analyses of type material of anamorphic fungi will hopefully allow their insertion in the available Ascomycete or Basidiomycete dendrograms and contribute to their classification. Such an integrated classificatory structure is bound to incite its completion at generic and specific levels. Then a classificatory structure can be devised for the integration of unconnected deuteromycetes into the system of Ascomycota and Basidiomycota, at the suprageneric level.

As a second step, two decisions must be taken. A first decision will select the teleo-typified names,

under the automatic mechanism of option A, that are to be protected at specific level, and those that are to be protected (mechanism 2) or to receive precedence (mechanism 3) at generic level. A second decision will determine whether the mechanisms of protection and precedence may exceptionally be applied selectively (option B) to certain ana-typified species and generic names over correlated teleo-typified names, with an estimation of the numbers of necessary recombinations. These decisions will determine which name is considered to be correct for each species, according to options A or B. The twofold decisions must be published and thoroughly discussed. Once an agreement is reached, the decision will be in force under whatever procedure is applied later.

In a next step it will have to be decided to what extent holomorphic application has to be assigned to non-connected ana-typified epithets and generic names. This is the main difference between the procedures as shown in Fig. 2 and 3. The answer will lead the way to one or the other procedure and to the necessary proposals for amending the *Code*.

At the end of the process and after approval of new rules by a Botanical Congress, thanks to protection/repression and/or precedence/restricted application, no alternate names will remain, at least at species level. Dual nomenclature will no longer exist. Only informal designations with cross-reference names will be used where desirable and possible (this will not equally be possible in all procedures). The practice of using the correct name must be propagated if the most representative or commonly used name is not already protected as the correct name. Sooner or later, application of this correct and prevalent name will be the simplest denomination for the anamorph as well.

In our opinion, all choices must go towards the simplest set of rules and a system of nomenclature as close as possible to the Linnaean system of nomenclature, as defined in the Principles of the *Code of Nomenclature*.

Acknowledgement

The first author wishes to thank the Mycothèque de l'Université Catholique de Louvain (MUCL) for financial support to present this paper at the 7th International Mycological Congress in Oslo in August 2002.

Annexe

The 33 possible cases of combinations that occur depending on types, application H or A and publication date of epithets and generic names in the 6 procedures.

There are 6 kinds of Epithets to enter combinations with 6 kinds of Generic names, depending on the kind of morph-type (ana- or teleo-), the kind of application (A or H) and the date of publication (pre-D or post-D). Three of the 36 theoretical cases are not occurring in the 6 procedures. N° of Procedures in which cases are occurring are in brackets. Rules to apply in the occurring 33 cases are indicated.

pre-D ana-typified A epithet	+ pre-D ana-typified A gen. n. (1, 4) priority rule
	+ pre-D ana-typified H gen. n. (don't exist in the procedures)
	+ post-D ana-typified A gen. n. (1) priority rule
	+ post-D ana-typified H gen. n. (4) permitted, obeys Art. 59.3 phrase 2
	+ pre-D teleo-typified H gen. n. (1, 4) Art. 59.6
	+ post-D teleo-typified H gen. n.(1, 4) Art. 59.6

post-D ana-typified A epithet	+ pre-D ana-typified A gen. n. (1) priority rule + pre-D ana-typified H gen. n. (don't exist in the procedures) + post-D ana-typified A gen. n. (1) priority rule + post-D ana-typified H gen. n. (don't exist in the procedures) + pre-D teleo-typified H gen. n. (1) Art. 59.6 + post-D teleo-typified H gen. n. (1) Art. 59.6
pre-D ana-typified H epithet	+ pre-D ana-typified A gen. n. (3, 5) possible, obeys Art. 59.3 phrase 2. + pre-D ana-typified H gen. n. (2, 6) priority rule + post-D ana-typified A gen. n. (3) possible, obeys Art. 59.3 phrase 2. + post-D ana-typified H gen. n. (2, 5, 6) priority rule + pre-D teleo-typified H gen. n. (2, 3, 5, 6) priority rule + post-D teleo-typified H gen. n. (2, 3, 5, 6) priority rule
post-D ana-typified H epithet	+ pre-D ana-typified A gen. n. (3, 4, 5) possible, obeys Art. 59.3 phrase 2. + pre-D ana-typified H gen. n. (2, 6) priority rule + post-D ana-typified A gen. n. (3) possible, obeys Art. 59.3 phrase 2. + post-D ana-typified H gen. n. (2,4,5,6) priority rule + pre-D teleo-typified H gen. n. (2, 3, 4, 5, 6) priority rule + post-D teleo-typified H gen. n. (2, 3, 4, 5, 6) priority rule
pre-D teleo-typified H epithet	+ pre-D ana-typified A gen. n. (1, 3, 4, 5) Art. 59.6 or to be repressed + pre-D ana-typified H gen. n. (2, 6) priority rule + post-D ana-typified A gen. n.(1, 3) Art. 59.6 or to be repressed + post-D ana-typified H gen.n. (2, 4, 5, 6) priority rule + pre-D teleo-typified H gen. n. (1, 2, 3, 4, 5, 6) priority rule + post-D teleo-typified H gen. n. (1, 2, 3, 4, 5, 6) priority rule
post-D teleo-typified H epithet	+ pre-D ana-typified A gen.n. (1, 3, 4, 5) Art. 59.6 or to be repressed + pre-D ana-typified H gen. n. (2, 6) priority rule + post-D ana-typified A gen. n.(1, 3) Art. 59.6 or to be repressed + post-D ana-typified H gen.n. (2, 4, 5, 6) priority rule + pre-D teleo-typified H gen. n. (1, 2, 3, 4, 5, 6) priority rule + post-D teleo-typified H gen. n. (1, 2, 3, 4, 5, 6) priority rule

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