BACTERIOLOGICAL NOMENCLATURE AND TAXONOMY

MICROBIOLOGICAL NOMENCLATURE

AT THE STOCKHOLM BOTANICAL CONGRESS, JULY 1950

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THE INTERNATIONAL Committee on Bacteriological Nomenclature at its meeting in Rio de Janeiro, August, 1950 approved the following resolution:

A careful study of the recent revisions of the botanical and zoological codes (of nomenclature) and of the special and peculiar needs of bacteriology should be made promptly.

This recommendation constituted a directive to the Editorial Board and to the Judicial Commission.

The International Botanical Congress held at Stockholm, July, 1950 modified and elaborated the Botanical Rules of Nomenclature in many ways that have direct effect upon nomenclature of microorganisms as used by microbiologists. There are in existence three international codes of nomenclature. The microbiologists, through their International Association of Microbiologists at the first Congress in Paris, 1930 and at succeeding Congresses, agreed that the bacteria and the viruses constitute groups having special problems, and that nomenclature of these groups may best be stabilized and confusion minimized by the development of an International Bacteriological Code of Nomenclature conforming as far as practicable with the corresponding botanical and zoological codes. It is recognized on the one hand that many of the provisions of the botanical and zoological codes have little or no application to the bacteria and viruses, and may well be omitted, and on the other hand

that the bacteria and viruses require certain special provisions. An International Bacteriological Code of Nomenclature was approved at the Copenhagen Congress in 1947.

However, the botanists retain their interest in the bacteria as plants, and the microbiologists recognize that the nomenclature of many groups of microorganisms such as the yeasts, fungi and algae is governed by the botanical rules. Furthermore, nomenclature of the protozoa, likewise of concern to the microbiologist, is governed by the zoological rules. The microbiologist may well note with some care those changes in the botanical rules that have to do with fungi, yeasts and algae and also those which may suggest desirable changes in the bacteri-

Several sources of information have been drawn upon for the following résumé. Preparations for the Stockholm Congress were greatly facilitated by the compilation of a 255 page Synopsis of Proposals (1) edited by Dr. J. Lanjouw, Acting Rapporteur General. This gives each rule and recommendation of the botanical rules, and under each lists the proposals for change, more than a hundred

(1) Lanjouw, J. Synopsis of Proposals concerning the International Rules of Botanical Nomenclature submitted to the Seventh International Botanical Congress, Stockholm, 1950. 255 pp. Utrecht, Netherlands.

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in all. A valuable contribution on mycological nomenclature at the Congress by Stevenson and Rogers (1) was recently published in the *Plant Disease Reporter*. Dr. D. P. Rogers, Secretary for the Special Committee on Fungi, has also supplied a mimeographed statement headed "To the Section on Nomenclature VII International Botanical Congress submitted by the Special Committee for Fungi", and a resume of pertinent changes in rules submitted to the special committee for their information and guidance. Dr. Rogers has kindly given permission to use this mimeographed material in preparation of the resume, and permission has also been secured from Dr. Stevenson and Dr. Rogers for quoting from the article in the *Plant Disease Reporter*.

The following paragraphs attempt to summarize the changes in the Botanical Rules of Nomenclature that are of special interest in microbiology. These paragraphs do not quote an authorized version, for the revised Botanical Code is still in process of editing and can not be available for some months.

1. USE OF THE TERM TAXON (PLURAL TAXA) Article 8 of the Botanical Rules was modified to read "Taxonomic groups of any rank will in the Rules generally be referred to as taxa (sing. taxon)".

A proposal was made at the Rio Congress to amend the corresponding statement in Bacteriological Code (Principle 5) similarly.

(1) Stevenson, John A. and Donald P. Rogers. Mycological Nomenclature at the 7th International Botanical Congress. *Plant Disease Reporter* 34: 327-333. 1950. Washington, D.C.

larly, but the resolution as finally approved made the use of the word taxon permissive, and not required. See Resume of Proceedings, and Proposals pp. 4 and 33 this BULLETIN.

2. DEFINITIONS OF THE TERMS
(1) LEGITIMATE NAME OR EPITHET
(2) EFFECTIVE PUBLICATION (3) VALID PUBLICATION (4) CORRECT NAME. Workers in biological fields, including bacteriology, wish to know if the proposed name of a taxon, such as species or genus or family or other, is the correct name. The formulation approved by the botanists may be of assistance in bacteriological thinking. New Article 8b reads:

"A legitimate name or epithet is one that is in strict accordance with the rules. Illegitimacy is defined in Articles 2 and 60 (Rules 24 and 25 Bacteriological Code). Effective publication is publication in strict accordance with Article 36 (Rule 11 Bacteriological Code). Valid publication is publication in strict accordance with Articles 37-45 (Rules 12-13 and 14 Bacteriological Code). Note: A correct name is the legitimate name of a taxon with a particular circumscription, position and rank."

3. SUBSTITUTION OF CORRECT NAME FOR VALID NAME. The first sentence of Article 16 (Principle 9 of the Bacteriological Code) has the phrase "correct name" substituted for the phrase "valid name" so that it now reads:

"Each group with a given circumscription, position and rank can bear only one correct name, the earliest that is in accordance with the Rules of Nomenclature."

It was also agreed to add the following statements clarifying the legitimacy of specific and subspecific epithets:

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"An epithet is not considered illegitimate merely because it was originally published under an illegitimate generic name but must be taken into consideration for purposes of priority if the epithet and the combination in question are in other aspects in accordance with the Rules. In the same way, an epithet of a subspecies or a taxon of lower rank may be legitimate even if originally published under an illegitimate name of the next higher taxon."

4 DETERMINATION OF THE NAMES OF TAXA BY MEANS OF NOMENCLATURAL TYPES. Article 18 (Principle 11 of the Bacteriological Code) was extensively amended. These changes are of interest to bacteriologists because of the approval given to the principle of more extensive use of the nomenclatural type concept by the Rio de Janeiro Congress. Somewhat related proposals will presently be placed before the International Committee on Bacteriological Nomenclature for consideration. The formulation of the revised Article 18 is as follows:

1) For small herbaceous plants and for most non-vascular plants the type may consist of more than one individual, which ought to be conserved permanently and assembled on one herbarium sheet or preparation. If it is proved later that such a type herbarium sheet or preparation contains parts belonging to more than one taxon, the name must remain attached to that part which corresponds most nearly with the original description.

2) For plants for which it is impossible to preserve a type specimen, the type may be a figure and/or a description.

3) In a species without a type specimen, the type may be a description or figure.

4) If a taxon is divided into a number of taxa of the same rank, the nomenclatural type of the original taxon must be the type of one of them.

5) If a taxon includes subordinate taxa its type must be or must include the type of one of each of the taxa of each subordinate rank.

Art. 18 quinquies.

The nomenclatural type of an order and of taxa between order and family is a family; that of a family and of taxa between family and genus is a genus; and that of a genus and of taxa between genus and species is a species.

The nomenclatural type of a taxon above the rank of genus, to the rank of order, whose name is formed in accordance with the Rules, is always the lower taxon whose name was derived from the same root (generic name).

Note. It is not felt that the type method can, at present, be profitably applied to the nomenclature of taxa above the rank of order.

5 FORMATION OF NAMES OF DIVISIONS, SUBDIVISIONS, CLASSES AND SUBCLASSES. Former Recommendation VIII was rewritten, with the provision that names of taxa above the rank of order are not based upon a type, but on a character or a group of characters, and with the proviso that for the Fungi the names of divisions are to end in *-mycota*, those of subdivisions in *-mycotina*, of classes *-mycete*, and of subclasses *-mycetidae*.

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6. FORMATION OF NAMES OF ORDERS AND SUBORDERS. A new article requires that names of orders shall end in *-ales* and of suborders in *-ineae*, and names of orders and suborders are to be derived from the names of included families. The rule of priority does not apply to names above those of families

7. FORMATION OF NAMES OF FAMILIES. Article 23 was modified so that the first sentence reads: The name of a family is a plural substantive (or an adjective used as a substantive) taken from the name of one of its genera, or a synonym, and ends in *-aceae*.

There is no requirement that the name of the type genus shall be the one chosen.

8. NAMES OF TAXA THAT HAVE BEEN PUBLISHED WITH IMPROPER TERMINATIONS. An interesting directive is appended to Art 24 relating to the treatment of names of taxa above the rank of genus that have been published with improper terminations. The statement added is:

When names of the above groups have been published with improper terminations, as *-cae* for a subfamily, *-idae* for a tribe the ending should be changed to accord with the rule without change of authority, if, however, the rank of the group is changed by a later author, he is then cited as authority for the name with the appropriate ending in the usual way.

9. USE OF ENDINGS *-oides* AND *-opsis* IN SUBGENERIC NAMES. Art 26 was modified with reference to the formation of subgeneric names to read as follows:

Subgeneric and sectional names must not repeat the name of the genus to which they belong with the termin-

ation *-oides* or *-opsis*.⁷ And the following statement was added:

The same subdivisional name may be used in different genera but in one and the same genus two subdivisions even of different rank cannot bear the same name unless they are based on the same type.

10. NAME OF THE SUBGENUS CONTAINING THE TYPE SPECIES OF A GENUS. It is of interest to note that one of the differences between the Botanical and Bacteriological Codes has been eliminated by the addition of a New Article 16 which reads:

The subgenus containing the type species of a generic name must bear that name unaltered.

The corresponding portion of Rule 5 in the Bacteriological Code reads:

If a genus is divided into subgenera, one of the subgenera (that which includes the type of the genus) should bear the same name as the genus.

This is essentially the same in the Zoological Code.

11. HYPHENATION OF SPECIFIC EPITHETS CONSISTING OF TWO WORDS. Article 27 relating to the names of species has the second sentence modified by change of the phrase "two or more words" to the phrase "two words" to read as follows:

If an epithet consists of two words, these must either be united or joined by a hyphen. There was also added the sentence:

Epithets not so joined when originally published are not to be rejected, but when used must be hyphenated.

12. AUTOMATIC CREATION OF SUBORDINATE TAXA. Article 28 relating to the formation of names of subspecific and varietal epithets was modified by inserting

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was modified by inserting the following statement before the first paragraph:

For nomenclatural purposes, a species and any taxon below the rank of a species is regarded as the sum of its lower taxa, if any. The description of a subordinated taxon which does not include the type of the higher taxon automatically creates a second subordinated taxon which includes the type of the higher taxon.

In other words, if an author describes a new subspecies or variety differing somewhat from the type of the species, he automatically creates at the same time a second variety or subspecies with the same epithet as that of the species.

13. AUTHORITY FOR SUBSPECIFIC EPITHETS CONTAINING THE TYPE OF THE SPECIES. Old Recommendation XVIII becomes a new Article 28 bis which reads:

If a taxon of whatever rank lower than a species, which includes the type of a species, is to be referred to by name, it must be designated by the correct specific epithet of the species, but contrary to Art. 46 without citation of an author's name. This epithet when used for a taxon within a species can be transferred only when the species name to which it is subordinated is itself transferred.

14. NAMES NOT ACCEPTED BY THE AUTHOR. A new Art. 37 bis reads as follows:

A name which is not accepted by the author who published it, but is merely proposed in anticipation of the *future* acceptance of the group concerned, or of a particular circumscription, position, or rank (*nomen provisorium*), or a name merely mentioned incidentally, is not validly published. The provision concerning acceptance by the author does not apply to names

or epithets published with a question mark or other indications of taxonomic doubt, yet published and accepted by the author. By "incidental mention" of a new name or combination is meant mention by an author who does not intend to introduce the new name or combination concerned. Beginning Jan. 1, 1953, alternative names shall be treated as not validly published.

15. CITATION OF THE BASONYM.

An additional proposal added to Art. 37 reads as follows:

Beginning with January 1, 1953 new transfers or new combinations will be considered validly published only when the basonym (name-bringing synonym) is clearly indicated with proper bibliographical reference.

The phrase name-bringing synonym or basonym is one which seems to be of increasing significance in the thinking of the botanists.

16. AUTHOR'S INTENT IN PUBLICATION OF BINOMIALS OR OTHER COMBINATIONS. Article 37 was further modified by the approval of the following proposal.

A binomial or other combination is not validly published unless the author definitely indicates that the epithets are to be used in a certain combination.

17. COMBINED SPECIFIC/GENERIC DESCRIPTION OF A NEW MONOTYPIC GENUS. A note was added to Art. 43 as follows:

A description of a species of a monotypic new genus or of the genus only is regarded as a combined generic and specific description, if the genus and species are published together and the genus or the species is not described.

A new Recommendation XX series adds:

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It is desirable that combined generic and specific description mention the points in which the new genus differs from its allies.

18. ADOPTION OF AN EPITHEI
PUBLISHED IN AN ILLEGITIMATE
COMBINATION. A new Recommendation
XXII bis was approved;

To avoid adoption of an epithet which has been previously published in an illegitimate combination.

19. RETENTION OF A NAME WHICH
EXCLUDES THE TYPE. A new article
47 bis was approved in line with
the reasoning used by the Editorial
Board of the International Com-
mittee on Bacteriological Nomen-
clature in the development of
the Preliminary Statement rela-
tive to the conservation or re-
jection of the generic name *Bac-*
terium.

Retention of a name in a sense which excludes the type can be effected only by conservation. When a name is conserved so as to exclude the type of the original author, it must not be ascribed to him with such expressions as *emend.*, *mutatis character.*, etc., but the name of the author whose concept is conserved should be cited as authority.

A new Recommendation also bears on conserved names.

In monographs and other critical works it is advisable to append the expression *nom. conserv.* to the citation; when even greater precision is desirable, the earlier application of the name against which conservation was effected should also be cited.

20. CITATION OF PUBLISHED
NAMES AS SYNONYMS. A new Recommendation XXXI was approved.

When citing a published name as synonym, it should be cited as published, without alteration of gender,

spelling or designation of categories or of a parenthetical author if given. When citing a *nomen nudum*, this should be indicated by adding *nom.* or *nom. nud.*

21. UNION OF TAXA OF THE SAME
RANK. To care for the problem of what to do when an author unites two taxa of the same rank and of same date the last sentence of Art. 56 is modified to read as follows:

The author who first unites the taxa and chooses one of the names or epithets concerned must be followed. In case of simultaneously published homonyms the first author definitely rejecting one in favor of the other fixes the usage.

22. NAMES OF FUNGI WITH A
PLEOMORPHIC LIFE CYCLE. All microbiologists are concerned with the problems of the names to be applied to fungi commonly studied in the laboratory which show two or more stages in the life cycle. Frequently the several stages have received different names. The old Article 57 was revised to read as follows:

In *Ascomycetes* and *Basidiomycetes* with two or more states in the life cycle (except those which are lichen fungi), but not in *Phycomycetes*, the first valid name or epithet applied to the perfect state takes precedence. The perfect state is that which bears asci in the *Ascomycetes*, which consists of the spores giving rise to basidia in the *Uredinales* and of the chlamydospores in the *Ustilaginales*, or which bears basidia in the remaining *Basidiomycetes*. The type specimen of a state must bear that state. However, the provisions of this article

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shall not be construed as preventing the use of names of imperfect states in works referring to such states

The author who first describes a perfect state may use the specific epithet of the corresponding imperfect state, but his binomial for the perfect state is to be attributed to him alone, and is not to be regarded as a transfer

When not already available, binomials for imperfect states may be proposed at the time of publication of the perfect state or later, using either the specific epithet of the perfect state or any other epithet available.

Stevenson and Rogers make the following comments: "It may be noted that this new wording definitely eliminates the *Phycomyces* from the rules that the perfect state name of pleomorphic fungi takes precedence, thus accepting Bisby's and Stevenson's and Shaw's proposals that in this group the first valid name applied to either the imperfect state (sporangia or conidia) or perfect state (oospores or zygospores) takes precedence." It also very definitely validates the use of imperfect state names when that is the state under study or discussion, even though the perfect state be known and named. For instance, a phytopathologist may use the name *Rhizoctonia solani* when that is the actual state under study, without reference to *Pellicularia filamentosa* (*Corticium solani*), the perfect state name. The new Rule therefore legalizes universal usage."

23 CHANGE OF NAME OF A TAXON HIGHER IN RANK THAN GENUS WHEN ITS RANK IS CHANGED. A new Article 58 bis reads:

When a taxon of higher rank than a genus is raised in rank or when the inverse

change occurs, the stem of the name must not be altered but only the termination (-inae, -eae, -oideae, -aceae, -ineae, -ales, etc.) unless the resulting name is rejected under Sec 12. (This is the section of the Botanical Rules including Articles 59-69 which deal with Rejection of Names.)

24 REJECTION, CHANGING OR MODIFICATION OF NAMES OR EPITHETS. Article 59 was modified slightly to read as follows:

A legitimate name or epithet must not be rejected, changed or modified merely because it is inappropriate, or disagreeable, or because another is preferable or better known, or because it has lost its original sense

25. NAME OF TAXON MADE UP OF TWO OR MORE DISCORDANT ELEMENTS. Art. 64 was modified to read as follows:

A name of a taxonomic group must be rejected if the characters of that group were derived from two or more entirely discordant elements, unless it is possible to select one of these elements as a satisfactory type for the name. For nomenclatural purposes names given to lichens must be considered as applying to their fungal components, but shall be subject to the provisions of Article 20(d)

26. CAPITALIZATION OF SPECIFIC EPITHETS. Whether or not specific epithets should be capitalized received much consideration. In one of the earlier sessions it was agreed that the statement should read "specific and sub-specific epithets should be written with a small initial letter." Later, however, this action was rescinded and

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the following Recommendation XLIII approved

All specific and trivial names or epithets should be written with a small initial letter, although writers desiring to use capital initial letters for particular names or epithets may do so when these are directly derived from the names of persons (or deities), or are vernacular (or barbaric) names, or are previously published (including pre-Linnean and invalid) unmodified generic names.

This, in a sense, legalizes the custom of such publications as Biological Abstracts which does not capitalize any specific epithets. It will also tend to bring botanical usage into line with usage in zoology and bacteriology.

Corrected Recommendation 27g in the Bacteriological Code reads "specific epithets, even those derived from names of persons, should not be capitalized."

27. CORRECTION OF ERRORS IN SPELLING. Article 70 was modified to read as follows:

The original spelling of a name or epithet must be retained, especially in the case of a misprint or error recognizable from the text of the original publication or corrected by the author himself. When the difference between two generic names lies in the termination, these names must be regarded as distinct even when differing by one letter only. This does not apply to mere orthographic variants of the same name. Orthographic variants are names or epithets which differ only in the following 1) ae, oe, and e; ei, i, j, and y; c and k; c and z; oe, ø, and o; æ, å, and a; ue, ü, and u; 2) presence or absence of an h before a vowel or after a consonant (aspirate); 3) absence or presence of a

c before t; 4) single or double consonant; 5) absence or presence of or difference in connective vowel or several (connective) letters in compound words (not applicable to names of different derivation); 6) different transcriptions of non-Latin or non-Greek words especially of the same personal name (not applicable to absence or presence of prefixes or suffixes or to translations into another language). Epithets are, in addition, orthographic variants if they have the same meaning and only slightly different form, especially if they differ only in endings (not applicable to the genitive or adjectival forms of a personal name or to differences in the second element in compound words).

Under Article 70 note 3 and note 4 were combined as note B with the following wording:

The alterations often made by earlier authors in founding nomenclature on personal names are intentional latinisation or abbreviation and not errors; they must be retained.

28. SPECIFIC EPITHETS FORMED FROM PERSONAL LATIN OR GREEK NAMES. The first sentence of Recommendation XL was modified to read as follows:

When a new specific or other epithet is taken from the name of a man, it should be formed in the following manner unless the personal name is already Latin or Greek, in which case the appropriate Latin genitive should be used -e.g., *alexandri* from Alexander, *francisci* from Franciscus, *augusti* from Augustus, *magni* from Magnus.

29. EPITHETS TAKEN FROM PLACE NAMES. New Recommendation XLI bis.

Epithets taken from place

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names are preferably adjectives and usually take the terminations *-ensis* or *-(a)nus* or *-icus*.

30. CORRECTION OF ORTHOGRAPHIC VARIANTS. Recommendation XLII was emended to read as follows: "New specific (or other) epithets should be written in conformity with the original spelling of the words from which they are derived and in accordance with the rules of Latin and latinization. In the case of orthographic variants of frequently used epithets enumerated in Appendix the orthography as occurring in the first column is recommended for future use while in names originally published in form indicated in the second column it will be admissible to replace the original orthography by the recommended one simply by treating it as an unintentional orthographic error. Example for appendix: correct orthography, *silvestris*, *sincensis*; incorrect orthography, *syvestris*, *chinensis*."

31. ORTHOGRAPHY OF COMPOUND SPECIFIC AND OTHER EPITHETS. To Recommendation XLIV the following addition was made:

Compound words shall be written as one word and not with a hyphen joining their component parts, even if originally spelt with a hyphen. It is recognized that in some cases, specific epithets may be made up of two distinct words which words then should be hyphenated.

32. REGULATIONS FOR DETERMINATION OF TYPES. This is a matter which was discussed at some length at the Rio Congress and a definite amendment was approved in principle. The regulations adopted by the botanists are relatively complicated, largely because of the complex

ities of the situation to be found when one is studying so many groups of plants. The regulation approved as an appendix to the botanical code is the one which will govern the fixing of type in microorganisms included under the fungi, yeasts and algae. This appendix 1 reads:

The following set of suggestions is intended both as a guide to the application of the Rules and as an indication of sound practice in the determination or selection of the nomenclatural types of previously published taxa. Where the application of a rule is embodied in a suggestion, reference is made to the appropriate article.

1) The choice of the original author, if definitely expressed at the time of the original publication of the name of the taxon is final. If he included only one element, that one must always be accepted as the *holotype*. (See Arts 18, 18 quater). If a new name is based on a previously published description of the taxon, the same considerations apply to material cited by the earlier author.

2) When a new name was published as an avowed substitute (*nomen novum*) for an older one (a new name based on the description accompanying an illegitimate one), the type of the new one is automatically that of the old one.

3) A lectotype may be chosen only when an author failed to designate a holotype, or when in species or taxa of lower rank, the type has been lost or destroyed (Art 18 note 3.)

4) Designation of a lectotype should only be undertaken in the light of an understanding of the group concerned. Mechanical systems, such as the automatic selection of the first species or specimen cited or a specimen collected

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by the person after whom a species is named, should be avoided as unscientific and productive of possible future confusion and further change. The original description of the taxon concerned should be the basic guide. (Art. 18 bis.)

a) In choosing a lectotype any indication of intent by the author of a name should be given preference unless it is contrary to his description and remarks. Such indications are manuscript notes, annotations on herbarium sheets, recognizable figures, epithets such as *typicus*, *genuinus*, *vulgaris*, *communis*, etc.

b) A lectotype must be chosen from among elements that were definitely studied by the author up to the time the taxon was published and included in it when it was published. (Art. 18 note 3)

c) Other things being equal, specimens should be given preference over pre-Linnean or other cited descriptions or plates when designating lectotypes or species.

d) In some cases where two or more elements were included in or cited with the original description the reviewer must use his own judgment in selection of a lectotype, but if another author has already segregated out one or more elements as other taxa, the residue or part of it should be designated as the type if its essential characters correspond to the original description. If it can be shown that the element fitting the whole published original account has been removed, it shall be restored and treated as lectotype (Art. 18 bis).

e) The first choice of a lectotype should be followed by subsequent workers unless

it can be shown that the choice does not fit the original description as well as another of the original elements (specimens, species, a higher taxa, etc.) (Art. 18 bis).

5) In selecting a *neotype* even more care and critical knowledge are essential, as the reviewer has usually no guide except his own judgment as to what best fits the original description. If his selection is faulty it will inevitably result in further change. The neotype may only be selected when all original material is believed lost or destroyed. (Art. 18 note 3, Art. 18 ter)

6) For names of fossil species the lectotype where one is needed should, if possible, be a specimen illustrated at the time of the first valid publication.

7) The nomenclatural typification of organ genera, form genera, of genera based on plant microfossils (pollen, spores, etc.), genera of imperfect fungi, or any other analogous genera, or lower taxa, does not differ from that recommended above.

33 RULES FOR CITATION. A proposal made by Dr. Rickett was accepted, with details to be worked out by the Editorial Committee. The proposal reads as follows.

It is recommended that the editors of the next edition of the International Rules be instructed to bring all citations of literature therein into conformity, selecting that standard of citation which seems best fitted to the needs of taxonomy.

It is proposed that the system must be embodied in a set of suggestions to form an appendix to the Rules and to serve as a model for botanists in the future.