

THE NOMENCLATURE OF TYPES

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1. Introduction

Not many years ago, when I first became interested in systematic botany, I experienced considerable difficulty in comprehending the full implication of the terms "Type" and "Co-Type". And although systematic botanists have now accepted the principle of the "Type basis Concept", a perusal of recent taxonomical papers combined with a personal inspection of the labelling of specimens in some of the well-known herbaria in Europe leads me to conclude that systematists are not yet agreed on a uniform system of naming both type specimens with their duplicates as well as those specimens that are almost as valuable to taxonomists as the types themselves. This disagreement is all the more surprising when one realises that systematists would be the first to admit the value of uniformity in the naming of type specimens for taxonomic reference. So great, however, is the confusion at present reigning concerning the nomenclature of some kinds of types that it more than bears out the remark made by Dr. Agnes Chase, the well-known agrostologist, with reference to plant nomenclature in general: "Paradoxical as it may sound, it is the effort made during the last twenty years or so to bring about stability and uniformity in the use of names that has caused such a bewildering diversity".

Now in the following summary I have gathered together most of the important terms used to designate type-specimens in the hope that this compilation may provoke the interest of herbarium-keepers in the matter. Obviously, by adopting a

uniform system of naming the type material in their charge, herbarium-keepers would increase considerably the value of the specimens. For the sake of clearness I have had to define again a few old terms and add a few new ones.

One apology I have to make: I cannot now cite authority for every one of the terms adopted in this paper.* This is because the compilation was originally for my own instruction only. However, most of the terms here discussed can be found in Dr. B. D. Jackson's *Glossary of Botanical Terms*, 4th Ed. (1928).

2. Varieties of Types

Nowadays a description of a new species is based on certain specimens, some or all of which are preserved in a herbarium. It is with the uniform naming of these specimens and their duplicates that I am most concerned. But because palæontological botany has its own system of type-classification, palæontological types will not be considered in this paper.

For accuracy in taxonomic work, especially in the revision of species, one must know the status of each specimen: whether, for instance, it was part of the original material on which the species was founded; how it came to be regarded as authentic or by whom it was identified; whether it was selected by the author as typical of his species or if it supplied any particular information. And in the case of duplicates, many other problems arise. For instance, if the original specimens on which an author founded his species are in one herbarium, can one consider the duplicates in another herbarium as equivalent? Did the author examine all the duplicates of each collection of the original material before they were distributed, or had he only one specimen of each at the time he drafted his description.

For taxonomic purposes equivalent duplicates must have been gathered at the same time from the same plant and must have the same collection number (cf. *Isotype* and *Clastotype* below). But it is common for collectors to take their duplicates from several plants of apparently the same species and perhaps at widely different dates, and to give these various specimens an

* After completing my paper I had an opportunity to consult Dr. D. L. Frizzell's compilation entitled TERMINOLOGY OF TYPES, published in *The American Midland Naturalist XIV*, 1933, pp. 637-668, and obtainable in a reprint form from the University of Notre Dame, Indiana, U.S.A. Though some terms like *Isotype*, *Isoholotype*, *Isolectotype*, etc. as used in systematic botany have not been recorded, the booklet is of special value as it gives full particulars regarding the authorship of the terms and the place of their publication, as well as references to the subsequent use of the terms in a sense different from the original. There are dealt in it 233 terms or phrases of which the word type, or its variant, forms a part, but only about half of this total number of terms explained pertains to the nomenclatorial types in biology, the others being non-nomenclatorial.

identical field number.* In some cases, as some fungi, herbs and small, little-branched palms, it will be evident from the material whether or not the duplicates are equivalent, but in most other cases it will not be so self-evident; and, should the collection be of some large and difficult genus like *Eugenia*, *Ficus*, *Eria*, *Calamus*, *Polypodium*, *Sphagnum* or *Sargassum*, one might doubt the collector's ability to distinguish every species in the field. A collection of such duplicates may be found after a critical study in the herbarium to comprise more than one species so that the duplicates are not equivalent; and if they are distributed before the mistake is realised, much confusion will result.

To avoid such doubts, and for reasons which will be apparent, I propose the following terms for the labelling of type-specimens so that in most cases there can be no doubt of the status of a herbarium specimen and its taxonomic value:

TYPE SPECIMEN: in a strict sense, is a herbarium specimen (a) that has been cited in the original description as having been seen by the author; or (b) if not cited, any original specimen on which the description of the species was based. For convenience all secondary types, which may be either specimens chosen as standards subsequent to the original description of the species or merely specimens matched with the type specimens, and all the duplicates of the type specimens *sensu stricto* and of the secondary types, are called the Type Specimens *sensu lato*. Type specimens *sensu lato* may be divided as follows:

A: Primary Types or Proterotypes (*Proteros*=first, former): are the type specimens *sensu stricto*. These are subdivided as follows:—

1. **HOLOTYPE** (*Holos*=entire): The specimen chosen by the author and cited in his original description as that by which the species must be interpreted.

2. **PARATYPE** (*Para*=beside): any proterotype other than the holotype.

* One cannot condemn too strongly the practice of lumping together specimens collected from different localities or/and on different dates and then giving the same field or distribution number as if they had been collected on one and the same day and from one and the same field; for under field conditions it could not have been possible for the collectors to compare the specimens, or the plants from which the specimens had been taken, in a living state. Further the specimens so distributed will convey a wrong idea of both the flowering and fruiting seasons of the plants as well as their distribution in the district. This will hold good even when the different localities whence the specimens were obtained lie in the same political or botanical district.

Collectors therefore should make it their rule, as far as possible, to collect from the same bush or plant all the specimens to be included under one field number; or, if this is not possible, to collect simultaneously from different plants growing in the same locality so that they may be compared in the living state in the field by the collector himself.

3. **SYNTYPE** (*Syn*=with): Any proterotype, if no holotype has been chosen.

B: Secondary Types or Heterotypes (*Heteros*=other): These are specimens chosen or studied subsequent to the original description. They may be divided as follows:—

1. **LECTOTYPE** or **LECTOHOLOTYPE** (*Lektos*=chosen): A syntype selected as a holotype. If the selection is made by the author of the species himself, then the Lectotype may be termed an **IDEOLECTOTYPE**. (*Ideos*=peculiar).

2. **LECTOPARATYPE**: A syntype not chosen for the Lectotype.

3. **APOTYPE** (*Apo*=from): A specimen on which is based the first correct interpretation of a species of which the description is too inadequate and the proterotypes are too imperfect or abnormal to furnish a clue for its correct identification. If both the types and the specific description cannot be identified except by an historical inquiry into the use of the specific name, then the specimen that supplies the historical clue becomes the *Logo-Apotype* (*Logos*=discourse).

4. **TOPOTYPE** (*Topos*=place): A specimen from a type locality agreeing with the type.

If it is from the Holotype, Paratype, Lectotype, etc. locality, then the specimen must be called accordingly a Topoholotype, Topoparatype, Topolectotype, etc.

5. **ICOTYPE** (*Ikos*=what is like): A specimen agreeing with the accepted standard of the species, but not from any Proterotype locality.

6. **NEOTYPE** (*Neos*=new): A specimen agreeing with the original description of a species, and selected as the type when no material from the proterotype collection exists.

According to the locality from which the Neotype is obtained, the specimen would be called Neotopotype (from the Holotype or Lectotype locality), Neoparatype, (from the Paratype locality), or Neoicotype (not from any Proterotype locality). (See also under *Proteromerotype* below).

7. **IDEOTYPE** or **IDIOTYPE** (*Idios*=peculiar or own): A specimen identified by the author as typical of his species.

According to the place whence the specimen was collected, it could be Ideotopotype, Ideoparatype, etc. (see also under Lectotype and Proteromerotype).

8. **PROTEROMEROTYPE** (*Meros*=a part): A specimen taken from the holotype plant because no herbarium material was preserved at the time of description.

If the specimen was taken by the author of the species, then the specimen may be called *Ideoproteromerotype* or simply *Ideomerotype* (cf. also *Merotype* below).

C. Duplicate Types or Antitypes (*Anti*=against; instead of): These are specimens purported to have been collected by the same collector at the same time and in the same place, and bearing the same number (if any) as the primary or the secondary types; or else fragments taken from types; or specimens derived from plants raised vegetatively or by seed from the type plants. They may be classified as follows:—

1. **ISOTYPE** (*Isos*=equal to): A specimen collected from the same plant as the type, at the same time, and bearing the same collection number.

2. **HAPTOTYPE** (*Hapto*=I fasten upon): A specimen purported to have been collected simultaneously with the type and bearing the same collection number, but not certainly from the type plant.

3. **MEROTYPE** (*Meros*=part): A specimen taken from a type plant but not simultaneously with the type, and consequently with a different number (cf. *Proteromerotype*).

4. **CLONOTYPE** (*Klon*=a young shoot): A specimen from an asexual offspring of a type-plant.

5. **SPERMOTYPE** (*Sperma*=seed): A specimen from the seed or spore offspring of a type plant.

6. **CLASTOTYPE** (*Klastos*=broken): A fragment of a type specimen. = *merotype* or *isotype* if from the same plant.

Note.—According to the status of the type-plant (*vide infra*), or type-specimen, from which these duplicates were obtained, so these prefixes can be added to define the duplicates more precisely *e.g.*: Isoholotype, Iso-paratype, Iso-apotype, Iso-neotype, Haptoneotype, Mero-holotype, Clonoparatype, Spermolectotype, Clastoproteromerotype.

3. Explanations of these Terms and Examples

1. **PRIMARY TYPES**:—In many older and also in some modern works on botany the specimens actually studied and on which the authors based their species are not cited. But from the range of distribution given for the species and from the history of the specimens together with any notes by the persons who studied the specimens, it is often possible to find out the specimen or specimens on which the species was based. Such specimens, therefore, though not cited in the original description, are also to be included in the *Primary Types* as defined herein.

Example 1:—*Damonorops pseudomirabilis* was described by Beccari as a new species but with the following particulars under its habitat or range of its distribution: "Cultivated at Buitenzorg,

from Palembang in Sumatra" (Rec. Bot. Surv. Ind. II, 1902 p. 226). Here no definite specimen is cited, though the holotype is in Beccari's herbarium, now forming the part of Webb's Herbarium in Florence.

Example 2:—In the *Catalogus Plantarum in Horto Botanico Bogoriensi Cultarum*, II, 1844, p. 58, Hasskarl published a new aroid, *Scindapsus pictus*, with a brief specific description only, without citing any specimens whatsoever or giving the range of the distribution of the species. Should there exist any specimens on which Hasskarl based the specific description of his species, those specimens will have to be included under the Primary types. If only one, it will be the Holotype of the species.

2. HOLOTYPE and PARATYPE:—Botanists frequently call the Holotype the "Type", but it is convenient to have the term Type (*i.e.* Type-specimen) with a more general meaning to indicate any specimen which is recognised as typical of the species. It is not essential to indicate directly the Holotype, indirect indication being quite sufficient. But, in order to be valid, indications of the Holotype, whether direct or indirect, must be made in print and simultaneously with the publication of the species itself. As for *Chirotypes* (types indicated in herbarium only and not in literature or types of manuscript species), these cannot be taken into account to the prejudice of published types. If only one specimen was cited by the author of the species, or if there was only one specimen for study and that was not cited, then that specimen becomes the holotype.

Example 1:—In the case of *Demonorops pseudomirabilis* (see the *Example 1* under the Primary Types) only one specimen derived from the plant cultivated in the Buitenzorg Botanic Gardens, was studied by Beccari. That specimen therefore is the holotype of the species.

Example 2:—F. von. Mueller, in erecting a new species, *Liviston-ia Mariae*, made the following observations: "Descriptio fructus, quæ species præcipue limitat solummodo e speciminibus occidentalibus pendet quum tantummodo foila hujus palmæ superbæ ex Australia centrali possideo, sed plantam ex utraque regione conspecificam arbitror" (Fragm. Phyto. XI, 1878, p. 54). Since the delimitation of the species was said to have been based chiefly on the fruits, it means that the West Australian specimen which bore fruits, and not the Central Australian one which was sterile, is the Holotype of Mueller's species. (The Central Australian is a paratype). When, therefore, Mueller recognised that the Central Australian plant was specifically distinct from the West Australian, he could not reserve the name, *L. Mariae*, for the former and give the latter (the Holotype of *L. Mariae*) the new name, *L. Alfredii*, (Vict. Nat. XI, 1892 p. 112). If a new species had to be erected to distinguish between two kinds of palms, then the paratype of *L. Mariae* (but never the holotype) could have been made the Holotype of the new species (cf. also Art. 52 of the Internat. Rules Bot. Nomencl., 1935).

Example 3:—Under the habitat of *Amomum terminale*, Ridley (in Journ. Roy. Asiat. Soc. Straits Br. XXXIV, 1900, p. 98,) the author of the species gave the following particulars: "Bismarck Archipelago (Micholitz). Flowered in the Botanic Gardens, Singapore, Feb. 1900". The description itself was obviously derived chiefly from a living plant. Hence only the specimen taken from the plant cultivated in the Singapore Gardens and studied in detail by Ridley must be regarded as the Holotype. Should it be necessary, at any

future date, to regard Micholitz's own specimen from the Bismarck Archipelago as distinct from the one that was derived from the plant cultivated in the Singapore Botanic Gardens, then, the name *A. terminale* Ridl. should be retained for the specimen derived from the cultivated plant.

Example 4:—In REINECKE, Fl. Samoa-Ins. in Engl., Bot. Jahrb. XXV (1898) 588, Warburg published a new binomial under *Cyphokentia* thus:

“C samœnsis Warb. (prob. = *Clinostigma samœnse* Wendl.)
Bonplandia X (1862) 196
“Upolu: Mai 1894 (n. 322)”.

Now this binomial of Warburg is being taken not as a new combination based on Wendland's species cited above in the synonymy, but as a new species with Reinecke's specimen from Upolu in Samoa as the holotype. But from Warburg's remarks on the species it is evident that the binomial is an isonym of Wendland's species (*i.e.* Wendland's species is the holotype of Warburg's binomial) and that the word “prob.” following the binomial was added to indicate that Reinecke's specimen was referred to the species with some doubt. I transcribe here the portion of Warburg's remarks that is most pertinent to the point in question:

“Dass diese Art mit *Clinostigma samœnse* identisch ist, erscheint mir nach WENDLAND'S Beschreibung (Bonplandia 1862, p. 196) zwar sehr wahrscheinlich aber nicht ganz zweifellos; nach derselben ist z. B. die Rachis der Hauptverzweigungen des Blütenstandes viel dicker (15–20 mm, bei unserem Exemplar nur 3–8); Er betont mit Recht, die Verwandtschaft der samoanischen typischen Art mit *Cyphokentia*, und ich sehe in der That nicht den mindesten Grund, warum unsere samoanische Art, sowie auch der WENDLAND' sche Typus der Gattung *Clinostigma* nicht zu *Cyphokentia* gehören soll, namentlich nicht in der weiteren Fassung Drude's in ENGLER-PRANTL.

“Ausser dieser Art werden noch 2 Arten zur Gattung *Clinostigma* gebracht———[Warburg then refers to an undescribed species and *Cl. Mooreanum*, but not to *Cl. samœnse* Wendl.]

Further, whereas in Reinecke's paper above quoted (cf. *op. cit.* Pandanaceæ pp. 578–581; Palmæ pp. 588–592; Ficus pp. 613–617) Warburg published a new species invariably with a diagnosis in Latin and with an “n. sp.” at the end of the binomial, he did neither of these things in the case of *Cyphokentia samœnsis*, being content to quote Wendland's species as a synonym and to show how Reinecke's specimen differed from Wendland's description of *Cl. samœnse* Wendl.

This procedure of interpreting a new isonym (=new combination or new name) is also in accord with the new International Rules of Botanical Nomenclature, ed. 1935 (cf. Art. 54), which prohibit the adoption of a new holotype for the species which has been transferred from one genus to another, the prohibition being valid whether or not this transference is accompanied with a new description drawn from a different plant or species (The case discussed in *Example 2* under SYNTYPES stands on a different footing).

In view of the above, one has to treat *Cyphokentia samœnsis* Warb. not as a new species, but as an isonym of *Clinostigma samœnse* Wendl.

Hence to avoid future complications and misinterpretations of the binomial *Clinostigma Warburgii* Becc. in Atti Soc. Tosc. Sci. Nat.

XLIV, 1934, p. 44,* I asked the late Count Professor Martelli to insert the words "quoad icon. et specimen a Reinecke lectum" immediately after its synonym, *Cyphokentia samansis* Warb., and to add the diagnosis in Latin, though in his manuscript Beccari had considered *C. samansis* Warb. as a new species independent of Wendland's, and treated *Cl. Warburgii* Becc. only as a new name for the former.

Example 5:—*Ixora nigricans* R. Br. made its appearance as a *nomen nudum* in Wallich's *Catalogue* (1828) n. 6154 and in Wight's *Catalogue* (1833) n. 1335. In 1834, however, it was published with a description in *Prodromus Floræ Peninsula Indiæ Orientalis* Vol. I, p. 428 by Wight and Arnott, who after quoting the references to the two catalogues, make the following remarks:

"This was sent to Dr. Wallich by Dr. Wight, but is not noticed under any of the letters of n. 6154; it perhaps, therefore, forms another species in the List, although we cannot see any difference between it and *I. nigricans*".

It is evident from this quotation that, though Wight and Arnott seem to take *I. nigricans* R. Br. in *Wall. Cat.* as a validly published species, yet the description they have given in the *Prodromus* is entirely of Wight's specimen. That this conclusion is correct is further confirmed by the observations Robert Wight has made in his *Icones*, which consist of figures of the Indian plants described in the *Prodromus* and in Wight's *Illustrations of Indian Botany*. After quoting bodily the description (with one or two verbal additions) Wight writes as follows:

"Some points of the character do not accurately correspond with the figure, which may be accounted for by the former being taken from dried specimens, the latter from the fresh plant; the divisions of the stigma do not separate at first and the mature berry is globose and purple, not unlike a small black cherry, but changes in drying." (*Icones* I, 1840, t. 318).

Now since *Arts.* 36 and 37 of the botanical *Rules* ed. 1935, do not recognize any of the names in the two above quoted *Catalogues*, even though these names had been placed on herbarium duplicates and thus made available to several botanical institutions, it follows that the binomial *I. nigricans* became systematically valid only with the botanical description published by Wight and Arnott; and as this description was based entirely on Wight's specimen n. 1335, this specimen is therefore the holotype of the species, which ought to be quoted as *I. nigricans* Wight and Arnott, *Prodr. Ind. I.* (1834) 428, though the *Rules* also permit one to quote it as *I. nigricans* R. Br. *ex* Wight and Arnott, despite the fact that the type of the species is not any of the specimens that R. Brown had seen.

* It may be noted here that, owing to ill-health of the late Count Professor Martelli, I was entrusted to frame all the diagnoses in Latin for Beccari's new genera and species published in the *Atti* so that the genera and species may be validated according to the resolutions passed by the International Botanical Congress, Cambridge, 1930. But before the paper was out and when it was too late to make any changes in it, a modification to this resolution was announced (*Journ. Bot.* LXXII, 1934 Suppl.) whereby the diagnoses in Latin were rendered unnecessary since Beccari's diagnoses were all in a modern language (Italian) and published before the end of the year 1934—two conditions that required to be satisfied in order to legitimize any new taxonomical unit published in any language other than Latin.

I mention these facts so that systematists may know which views to follow should they notice any discrepancies between the Latin and the Italian descriptions.

From this it is obvious that any interpretation of the species by a reference to any of the specimens distributed by Wallich under 6154 A-D is not permissible, though these specimens may be included as the paratypes of the species.

According to King the specimens distributed under Wallich's Cat. n. 6154 are of more than one species. (*Materials Fl. Malay. Pen. IV*, 1904 p. 149). Probably the failure to recognize this, and also to accept Wight's specimen as the holotype of *I. nigricans* has contributed to a great deal of confusion over the species.

3. SYNTYPE:—If the author has not indicated either directly or indirectly the Holotype specimen and if there are more than one Proterotype, then all the Proterotypes are called Syntypes of the species. No species, therefore, can have both the Holotype and Syntypes, or Paratypes and Syntypes. In its original sense the term *Co-type** (*Co* = *Cum* = with, together) is also synonymous, but because *Cotype* has been used loosely for Paratype, Isotype, HapTOTYPE or Merotype as well, I propose to drop the term in favour of Syntype, which is now becoming popular (See also Lectotype).

Example 1:—In Philipp. Journ. Sci. 58 (1935) 14, Danser quoted the specimen *leg.* Ramos and Endano n. 38740 in the Manila herbarium as the type (=holotype), and its duplicates in the herbaria of Berlin, Leiden and Buitenzorg as the cotypes, of his species, *Amylotheca amplexicaulis*. As all the three latter specimens were definitely cited by Danser as examples of his species, the term "cotypes" was used here to indicate the specimens that are both paratypes as well as haptoholotypes (=duplicates of holotypes) of the species.

In another case (op. cit. Vol. 58, p. 23) Danser indicated the specimen *leg.* McGregor n. 43873 from the Manila herbarium as the type (=holotype), and its duplicates in the herbaria of the New York Botanic Gardens and of the University of California, Berkeley, as the cotypes, of *Loranthus cordilimbus* Merr. (synonym of *Amylotheca saccata* Dans.). But as Merrill has not referred in his description to the duplicates of the holotype as examples of his species (op. cit. 30, 1926 pp. 389 and 391), it follows that by the term "cotypes" Danser merely means haptoholotypes.

Example 2:—In *Prodr. Flor. Nov. Holl. I* (1810) 225, Robert Brown published the new binomial, *Heleocharis capitata*, to include a species which he had collected in Australia, with the following remarks:

"*Scirpus capitatus* Linn. sp. pl. ed. Willd. I p. 294 (secundum synonyma Brownei et Sloanii, sed a planta virginiana Herb. Gron. diversus; hæc autem, quoniam Linnæus, cum primum Sp. pl. edebat, nullum hujus exemplum in herbario suo habebat, istius speciei unica auctoritas est.).

Scirpus culmo nudo, spica terminatrice subrotunda. Hort. Cliff. 21 (fide specimenis Herb. Cliff)'."

Here Brown does not state that his species is either *S. capitatus* L. *sensu* Willd. or *S. capitatus* Willd. *excl. syn Linn. et Gronov.*, but that the Linnean species with its type specimen from Virginia in the Gronovian herbarium [*i.e.* Clayton's plant] is not his *Heleocharis capitata*, that *S. capitatus* L. *sensu* Willd. is a mixed species, and that, as far as is known to him, only Willdenow's synonyms referring to Patrick Browne and Sloane are to be included in his species.

* As a rule Zoologists use this term correctly to mean syntypes.

Consequently it is illegitimate to treat *Heleocharis capitata* R. Br. as a new combination based on *Scirpus capitatus* Linn., *Sp. Pl.* I (1753) p. 48, and thus make precisely the plant that R. Brown excluded from his binomial the holotype of Brown's species. Despite the current practice, therefore, it is right to look upon *H. capitata* R. Br., not as new combination, but as an entirely new species, having for its syntypes the following specimens: R. Brown's specimen from Australia [Gulf of Carpentaria]; Clifford's specimens; and the Jamaican specimens from Sloane's and Browne's herbaria: all of which were referred by R. Brown in his description or remarks. The Caribæan (West Indian) specimens that Willdenow referred to *S. capitatus* are not to be included among the syntypes of Brown's species, nor should Willdenow's name be added in brackets after Brown's binomial and before Brown's initials (as it has been done by Dr. O. A. Farwell in *Rhodora* XXXII, 1930, p. 181) (cf. *Example 4* under Lectotype).

Note:—Several botanists including C. B. Clarke (*Journ. Linn. Soc. Lond.* XXX, 1894, p. 310), Dr. S. F. Blake (*Rhodora* XX, 1918, p. 24) and Dr. O. A. Farwell (*Rhodora*, XXXII, 1930, p. 181) have ignored altogether the remarks made by R. Brown to the effect that at the time of the first edition of the *Species Plantarum* (1753) no specimens of *Scirpus capitatus* existed in Linnæus's herbarium, and have accordingly caused a good deal of confusion over the interpretation of *S. capitatus* and *Heleocharis capitata*, Clarke and Blake going to the length of treating the former binomial as the "basinym" of the latter. It is true that there are now in the Linnean herbarium two specimens both named as *S. capitatus* by Linnæus himself; but at the same time there is no valid reason to disregard R. Brown's note about their non-existence there in 1753. On the contrary the fact that neither of the specimens was listed by Linnæus in the three enumerations of his herbarium supports R. Brown's contention. Mr. J. E. Dandy of the British Museum, London, who has looked up the matter, at my request, informs me that one of the specimens identified by Clarke (l. c.) as *H. ovata* was received from Kalm, and that the other representing *H. caribæa* was from P. Browne.* Mr. Dandy has also verified that *H. capitata* R. Br. is identical with *H. geniculata* (L) Rœm. and Schult. quoad var *B*, the diagnosis from *Hort. Cliff.* quoted by R. Brown being according to the original. This means, therefore, that *H. caribæa* (Rottb.) Blake and *H. capitatus* R. Br. are synonyms of *H. geniculata* (L) R. and S. as here interpreted (vide *Example 4* under Lectotype) and also that the species that pass as *H. geniculata* and *S. capitatus* should be known respectively as *H. elegans* Rœm. Schult., and *H. filiformis* (Lam.) Kunth = *H. tenuis* (Willd.) Schult.

Example 3:—In *Floræ Siamensis Enumeratio* II, pt. 2 (1934) 147, the late Prof. W. G. Craib published a new variety, *Ixora affinis* Wall. ex G. Don var. *arguta* Craib comb. nov., by the following citations:

I. arguta R. Br. ex King in *Journ. As. Soc. Beng.* LXXII, 2 (1904) p. 74. *I. nigricans* R. Br. ex Wight et Arn. var. *arguta* Hook. f., *Flor. Brit. Ind.* III (1880) 149 *pro parte*.

After enumerating several specimens from the Peninsula Siam, Prof. Craib indicates that, outside that region, this variety occurs only in the Malay Peninsula and that its type (=holotype) is from Penang; but as no specimen from Penang was quoted by Hooker, who was the first to make the valid use of the term *arguta* in the synonyms quoted above, it seems worth while to investigate the exact status of the types of all the three names.

* Linnæus acquired Browne's herbarium in 1758. Browne published his *Natural History of Jamaica* in 1756.

Under *I. nigricans* var. *arguta*, Hooker cited only two specimens, both of which are from India, one from Heyne (the only one cited in Wallich's Catalogue n. 6157) and the other from Ritchie; and, though the species proper is said to occur in Burma and the Malay Peninsula, Hooker has not made any definite statement as to the occurrence of the variety outside India.

Now King, *l.c.* discovered that Wallich's n. 6154 A-D, to which the manuscript name *I. nigricans* R. Br. was first attached though not, validly published, represented more than one species and concluded that Hooker had made a muddle of *I. nigricans* in having quoted for it Wallich's n. 6154 without any distinction of letters, King having overlooked the fact that *I. nigricans* was validated much earlier than Hooker by Wight and Arnott in their *Prodromus I* (1834) 428, a reference also given by Hooker, and that, therefore, the species had to be interpreted by a reference to Wight's n. 1335 (*vide Example 5* above under Holotype). In the hope of getting over this confusion erroneously attributed to Hooker, King restored *I. ?arguta* R. Br. in Wall. Cat. n. 6157 for the Malayan plant referred by Hooker to *I. nigricans*, but quoted at the same time *I. nigricans* var. *arguta* Hook. fil. as a synonym and made the following observations on the types:

"The type specimens of this [species] in the Wallichian Catalogue [n. 6157] consist of two sheets distinguished by the letters A. and B. The former was received from Herb. Heyne, and is therefore supposed to have come from Southern India. Sheet B is attributed to Penang."

Now according to Art. 58 of the botanical Rules, King was not obliged to adopt the trivial name *arguta* for his species, even though the species was to be validated by citing *I. nigricans* var. *arguta* Hook. f.. But having adopted the name, cited the variety in the synonymy, and quoted at least one of the two syntypes of the variety as a type of the species, King's species cannot be regarded except as a new combination based on Hooker's variety. One is not at liberty to assume that King had drawn his specific description entirely from the new set of specimens and that he had not personally seen any of the syntypes of Hooker's variety, regarding Heyne's specimen seen by King as the duplicate of Hooker's syntype (cf. Arts. 18, 49, 50-52). In Wallich's Catalogue only one specimen is listed under n. 6157 without any distinctive letter, and that one is from Heyne, which is also quoted as the syntype of Hooker's variety. As Hooker did not cite any specimen from Penang, Wallich Cat. n. 6157-B from Penang cannot be included among the syntypes of King's *I. arguta*, unless it can be satisfactorily shown that the omission was clearly a printer's error or a lapsus calami. If it is proved that Ritchie's specimen cited by Hooker is distinct and cannot be included under the variety, then Heyne's specimen will become the Lectoholotype of *I. arguta* King as well as of *I. nigricans* var. *arguta* Hook. f.

Now if Prof. Craib was of the opinion that neither of the syntypes of Hooker's variety corresponded to the Malayan specimens referred by King to *I. arguta* and still considered that his own variety *I. affinis* var. *arguta* should refer only to the Malayan specimens cited by King, and not to any of the two Indian specimens referred by Hooker, then he could not validate the variety by citations. He could have however quoted the synonyms and shown how the syntypes of Hooker's variety were to be excluded. But since he has not followed this procedure, it means that, despite the use of *pro parte* after Hooker's trinomial quoted in the synonymy of *I. affinis* var. *arguta* Craib, the latter variety has to be considered as a new combination entirely based on Hooker's variety, and that the syntypes of the former are precisely those of the latter and not any more or less. In new combinations the Rules do not allow a person to choose a new

set of syntypes from specimens that are not the primary types of the original species or variety on which the combination is based (Arts. 18, 49, 50-52 and 53).

4. **LECTOTYPE**:—Where there is reason to doubt whether the syntypes are specifically identical it is useful to distinguish one specimen as the Lectotype. And it is advisable that a competent systematist should make this selection. It is futile merely to choose the specimen first cited in a description where the order of citation has no such preferential significance. Besides no specimen is likely to be uniformly accepted as the standard (Lectotype) of a species unless cogent reasons are brought in favour of the selected specimen. Where there are equally good botanical reasons in favour of more than one specimen being chosen as the Lectotype, systematists must, in the interest of stability of the nomenclature, accept as the standard of the (original) species the first published choice of a Lectotype.

Note:—I wish to protest against unnecessary alterations being made in the status of the syntypes even when the changes made are by the author of the species himself. If an author desires to bind the interpretation of his species to any one particular syntype, then to make the binding valid he must indicate, at the time of publication of the species, that specimen as the holotype (unless of course the omission from the original description is a *lapsus calami* or the fault of copyists or printers, in which case correction should follow as early as possible). Later when the specific binomial has become, by publication, an entity in the dominion of taxonomical science, the author has as much or as little right as anybody else to make valid alterations in any part of the species. If, subsequent to the publication of the species, an author who has omitted to name the holotype in the original description, doubts the specific identity of the syntypes or fears a misinterpretation of his species, he should investigate the entire species again and choose a lectotype; or, if that is not possible, he should indicate both the specimens on which he had based the most important portion of the specific diagnosis, as well as those which appear to him to be not typical of the species, though not cited in the original description. But a lectotype should not be chosen unless it is really necessary; in other words, if a botanist examining the syntypes of a species cannot find any specific or varietal difference among them, he should not distinguish one as a lectotype. This procedure will not only prevent a systematist from making an unnecessary or haphazard distinction among the several syntypes and avoid thereby a misdirection of future studies regarding the species and the types, but also oblige him, before selecting the Lectotype, to show the need for distinguishing one syntype from another.

Example 1:—In 1931 Dr. E. Hultén and Dr. H. St. John jointly published a new aroid, *Lysichitum americanum*, without indicating the Holotype (*Svensk Bot. Tidskr.* XXV, 1931 pp. 153-464). Though

the paper was published jointly, they elaborated their work in two different places, the senior author in Europe and Asia, the junior author in America; and they admitted that even at the time of publication they had not had an opportunity to complete the revision side by side. Later, apparently they met in America and jointly selected a specimen which, for several reasons, seemed to them best "fitted to stand as the type of the new species". (*Op. cit.* XXVIII, pt. 2, 1934). Though this selected specimen is proposed as the Holotype, it is evident from the definitions proposed above that it may not be accepted except as a Lectotype, and, being chosen by the authors of the species themselves, it can be labelled as an *Ideolectotype*. Should, in future, the species prove to be composite, it is questionable whether one should abide by this Ideolectotype. An objection that becomes at once apparent is that, up to the time of the publication of the species, the senior author had not seen the specimen later chosen as Ideolectotype, while it is not sure whether the junior had based on the specimen any portion of his conclusions regarding the new species. But, if no serious objection is found against this Ideolectotype, preference should certainly be given to it in any future investigation concerning the status of the species.

Example 2:—Having shown that the syntypes of *Dæmonorops propinquus* Becc. belong to more than one species, I retained this specific name for Griffith's fruit-bearing specimen (a syntype of *D. propinquus*) and transferred Forbes's specimen (another syntype) to another species (*D. confusus*) then described in *Gard. Bull. S.S. VIII*, 1935 p. 347 and 348. Griffith's specimen becomes accordingly the Lectotype of *D. propinquus* Becc. It should not be permissible to disregard this first selection of the Lectotype on such trivial grounds that the specimen was not the one cited first in the original description or on the ground that it was Forbes's specimen which had suggested to Beccari the specific epithet "propinquus". Or else the nomenclature of both the species (*D. propinquus* and *D. confusus*) will become unstable.

Example 3:—Retzius pointed out in his *Observations Botanicae IV* (1786) 20 that the Linnean species, *Poa amboinica*, agreed in its description with a specimen from India, distributed under that name by Kœnig, while the Rumphian species, *Phœnix amboinica montana*, cited in the synonymy by Linnæus was totally a different species both as regards its description and as regards its illustrations. Retzius therefore excluded the Rumphian species from the synonymy of *P. amboinica* L., giving, at the same time, a fuller description of the species represented by Kœnig's plant, to which Retzius exclusively reserved the Linnean binomial. It is not known whether Retzius had with him Linnæus's type; but from historical ground it appears certain that Linnæus had based his specific description of *P. amboinica* on a specimen collected by Kœnig in S. India. Kœnig's specimen in Retzius's herbarium (in Lund) becomes either the Lectotype of the species if the specimen was the same as the one studied by Linnæus; or, if not, the specimen is a Neotype or, to be more precise, a Neotopotype, and it will remain so unless the specimen actually studied by Linnæus is discovered, when the specimen in Retzius's herbarium would become merely a Topotype.

Note:—Though the fact that Retzius had excluded the Rumphian species from the synonymy of *P. amboinica* L. was at times overlooked, Retzius's interpretation of the species was almost universally accepted until Dr. E. D. Merrill (*Interpr. Rumph. Herb. Amb.*, 1917, p. 88) made a new combination *Andropogon amboinicus* (L) Merr., on the supposed grounds that *P. amboinica* L. was entirely based on *Phœnix amboinica montana* Rumph.. After an extensive inquiry into this subject, Mr. C. E. Fischer (*Kew Bull.*, 1934, pp. 398-400) came to the conclusion that Linnæus had based his description of *P.*

amboinica on a specimen from S. India sent to him by Kœnig and that the Rumphian species quoted in its synonymy is altogether a different species, belonging neither to the genus *Poa* in the Linnean sense, nor to *Eragrostis* to which Kœnig's specimen and the Linnean description of *P. amboinica* are now referred. In other words, Mr. Fischer admits that the specimen on which Linnæus based the chief part of his specific description was not the Rumphian species, but a specimen from Kœnig. But because the Rumphian species had suggested to Linnæus the trivial name for Kœnig's plant, Mr. Fischer concludes that the specific epithet in *P. amboinica* L. should be reserved for the Rumphian species referred to the genus *Andropogon* by Merrill. Thus Mr. Fischer maintains that the Rumphian species must be accepted as the Lectotype of *P. amboinica* L., so that *Andropogon amboinicus* (L.) Merr. (1917) is a legitimate combination, and that *P. amboinica* L. emendavit Retzius (1786) = *Eragrostis amboinica* [*amboinensis*] (L. emend. Retz) Trinius (1840) is illegitimate as a name for *Poa riparia* Willd. (1803) = *Eragrostis riparia* (Willd.) Nees (1829). The reasons given by Mr. Fischer for discarding Retzius's legitimate interpretation of *P. amboinica* L. are botanically of minor importance (cf. *Example 2* above); and so in the interest of stability in the nomenclature of the species included in the original *Poa amboinica* L. the newer interpretation by Dr. Merrill and Mr. Fischer should not be possible.

Though *Art 52* of the International Rules of Botanical Nomenclature, 3rd Ed. (1935) is incomplete, as the Appendix *I* which promises to regulate the choice of Lectotypes is not yet published, one can successfully maintain that Linnæus had not fully studied the figures and description of *Phœnix amboinica montana* Rumph., (pre-Linnæan), and that the only plant he had studied in detail and on which, moreover, he had based his diagnosis was a specimen either sent to him by Kœnig, or raised by Linnæus from the seeds sent by Kœnig. Therefore the type of *Poa amboinica* L. must be Kœnig's plant and not the Rumphian species which Linnæus had cited presumably as an approximate synonym of *P. amboinica*; if the type has been lost, Retzius has provided a Neotopotype. But even granting that both Kœnig's plant and the Rumphian species have each an equal claim to be chosen as the Lectotype, it seems but right to allow the author who first recognised the mixed composition of a species to select the Lectotype. A parallel may be found in *Art. 56* of the Rules which confers full rights on the author to choose, when uniting two or more species of the same date, any one of the specific epithets as legitimate for the group resulting from the union of the species, unless of course the resulting binomial becomes a tautonym or a later homonym. Such reasons as the unsuitability of the trivial name cannot be successfully adduced against an already published choice.

Example 4:—*SCIRPUS GENICULATUS* L., Spec. Pl. I (1753) 48, with description, *Scirpus culmo tereti nudo, subglobosa terminali*, was based on at least three syntypes: (a) *Scirpus culmo nudo, spica terminali* [*terminatrice*] *subrotunda* L., Hort Cliffort. (1737) 21; (b) *Juncus aquaticus geniculatus, capitulis equiseti, major* Sloane, Cat. Pl. Ins. Jam. (1696) 37; Voy. Jam. Nat. Hist. I (1707) 121 t. 81 fig. 3; and (c) *Juncus aquaticus geniculatus, capitulis equiseti, minor* Sloane, *id.* Cat. (1696) 37; *id.* Voy. (1707) 122 t. 75 fig. 2. [There is also a specimen in Linnæus's herbarium named by Linnæus himself as "*Scirpus geniculatus 3*", which, according to Mr. Dandy, was not in the Linnean herbarium in 1753 and so it has not status as regards the typification of *S. geniculatus*: its spike is long and cylindrical and not subglobose as described by Linnæus. It has long been referred to *Heleocharis interstincta* (Vahl) R. Br. (cf. C. B. Clarke, in Journ. Linn. Soc., Lond. XXX, 1894, p. 309)].

The types of the Sloane references are still extant, and Mr. E. J. Dandy, of the British Museum, London, informs me that the type of *Juncus*———*major* pertains to the long-spiked species commonly known as *H. geniculata*, and that of *Juncus*———*minor*, like that of *Scirpus*———*subrotunda* Hort. Cliff. 21, represents a small round-headed species, identical with *H. capitata* R. Br. (= *H. caribæa* Blake) and agreeing with the Linnean description of *S. geniculatus*. Since the type of *Juncus*———*major*, Sloane, does not accord with the Linnean description, it also cannot be chosen for the Lectotype of the species. This means that the current interpretation of the species *Heleocharis geniculata* (L.) Røem. and Schult. is erroneous, being applicable to the species that should be known as *H. elegans* (Humb. and Kunth) Røem. and Sch.

These two exclusions leave still two more syntypes, out of which the Lectotype of *H. geniculata* must be chosen. In this connection, it must be noted that, though Sloane's references seem to have suggested to Linnæus the specific epithet "geniculatus", the Hortus Cliffortianus supplied the bulk of the specific description that accompanied the publication of *S. geniculatus* in Linn., Spec., Pl. I (1753) 48, and since this Hortus Cliffortianus reference also alludes to the syntype with which Linnæus was best acquainted (Linnæus having examined and described it in the Hortus), the specimen in Clifford's herbarium should, therefore, be considered as the Lectotype of *H. geniculata* (L.) Røem. and Schult. as *emended* here. Sloane's type of *Juncus*———*minor*, with which Linnæus was less acquainted, and on which the specific description was not based, becomes, thereby, its Lecto-paratype. cf. Note on the syntype: *Example 2*.

5. APOTYPE:—From the definition given above it will be seen that an Apotype is not merely a specimen that helped to complete the description of a species; rather it is one that helped to supply the chief diagnostic or identification clue lacking both in the original description and the proterotypes of the species. This definition slightly alters the meaning given in Jackson's *Glossary* where the term Apotype is defined as a "supplementary type aiding the completion of descriptions"—a definition that would include also the Topotypes and Icotypes as defined here (*vide infra*).

Example 1:—In this category will come any specimen that helped first to identify definitely the species, which, like *Scindapsus pictus* Hassk., *Scindapsus argyræus* Engl. or *Pothos pinnatus* Wall., were based on juvenile forms or sterile specimens.

Example 2:—*Pinanga maculata* Porte ex Lem. (1863)—a native of the Philippines—was founded on a juvenile mottled form cultivated in Europe. As the mottling occurs frequently in the juvenile forms of several *Pinanga* palms, the species was regarded as unidentifiable. Since the species was described from living specimens cultivated in Europe, I undertook in Europe an inquiry into this subject and found that the Philippine plant cultivated there as *P. maculata* was identical with *P. Copelandii* Becc. (*Fedde, Repert.* XXXV, 1934, p. 281). The specimen that gave the most important clue to this identification was Vilmorin's specimen in Wendland's herbarium. This specimen should, therefore, be called the Apotype or Logo-Apotype of *P. maculata*.

6. TOPOTYPES and ICOTYPES:—Even when the Proterotype is characteristic, then similar specimens from the Proterotype, or even from other, localities are of great value,

especially to the herbaria that possess only imperfect material, or none at all, of the Proterotype collections. Moreover such specimens may serve to supplement the details concerning either the plant organs not represented in the original specimens, or the full range of variation in the species. Hence the need to distinguish Topotypes and Icotypes from Apotypes.

In Jackson's Glossary, Icotypes are defined as "Types serving for identification, but not previously used in literature". According to that definition, Icotype specimens, as soon as they are cited in literature, would cease to be Icotypes and would therefore have to be relabelled—a thing not always easy to do when most botanical institutions do not have a staff enough to cope with such a work. Besides Jackson's definition would also include the Topotypes that are not used in literature. To avoid this I have modified the definition of Icotype to include only those specimens that agree with the original type though not from type localities, and irrespective of the fact that they are or are not cited in literature.

Note:—According to the status of the locality from which the Proterotype was obtained, the prefix *Topo* can be added to define the newer collections more accurately; e.g. Topoholotype, Topoparatype, Topolectotype, Topoapotype, etc. Similarly the prefix *Ico* will indicate the status of the type specimen with which the Icotype has been compared: e.g. Icoholotype, Icoparatype, Iconeotype, etc.

Example:—In the case of *Poa amboinica* L. emend. Retzius, discussed under Lectotype (*Example 3*), Mr. Fischer mentions, besides the specimen (the Neotype or Lectotype) in Retzius's herbarium in Lund, two other specimens of *Eragrostis amboinica* [*amboinensis*] (L.) Trin., that are preserved in the Smithian and the Natural History Museum herbaria in London. One of these specimens was collected from the Lectotype locality in South India, while the other was grown in England from the seeds collected from the same locality. Both these specimens will have to be called Topolectotype, or Toponeotype.

7. NEOTYPE:—

Example 1:—*Scirpus glaucescens* Willd. (the basynym of *Heleocharis glaucescens* Schultes) was described as having had compressed stems and trifid styles, but the only specimen with that name in Willdenow's herbarium has been identified by specialists as *Heleocharis palustris* (L.) R. and S., a species with non-compressed stems and bifid styles. Now should the specimen in Willdenow's herbarium be considered the holotype of *H. glaucescens* (Willd.) Schult? If that specimen has been correctly identified as *H. palustris*, it cannot be *H. glaucescens* (*ex descriptione*), and so one may presume that the holotype of the latter has been lost or mislaid; but, if it really has compressed stems and trifid styles, it can be taken as the holotype of *H. glaucescens*. As the type plant of *H. glaucescens* was growing in the Berlin Botanic Gardens, it is possible, that Willdenow, the director of the institution, did not preserve the actual specimen which he dissected and from which he drew his specific diagnosis, and that later, in order to fill up the gap in the herbarium, he took a specimen of what appeared to him the type plant or a plant identical with it.

Dr. O. A. Farwell (Rhodora, XXXII, 1930) shows that, excepting perhaps the one phrase *glauco-virescens*, Willdenow's description is quite applicable to *H. acuminata* (Muhl) Nees and that "his characters of *three styles* and *compressed stems* clinch the identity. No other species of the genus known to me so well fills the bill; certainly not the plants in America masquerading as *H. glaucescens*, for they have two stigmas and the stems are not compressed." If Farwell's identification of the species is correct, then the Holotype of *H. acuminata* becomes the Neotype of *H. glaucescens* (Willd.) Schultes. [But whatever may be the status of Willdenow's specimen (Pseudotype or Holotype), it is evident that Willdenow's description does not apply to *H. palustris* (L.) R. and S., and so Willdenow's species (*ex descriptione*) cannot be regarded as a synonym of the latter] (see also the *Example* under Merotype and Proteromerotype).

Example 2:—cf. *Example 3* under Lectotype.

8. IDEOTYPE:—According to Jackson's Glossary, an Ideotype is "a specimen identified by the describer, but not from the original locality", while a specimen identified by the describer from the original locality is called a *Metatype* (-*Meta* = with; after). But since a heterotype chosen or identified by an author may fall in any of the several heterotype categories, I modify this definition so that the prefix *Ideo* shall denote a heterotype identified or chosen by the author of species. Thus there could be Ideolectotype, Ideotopotype (*Metatype*), Ideoproteromerotype, Ideoneotype, Ideoicotype, etc.

Examples:—cf. *Example 1* under Lectotype and *Example 1* under Merotype and Proteromerotype.

9. MEROTYPE and PROTEROMEROTYPE:—For taxonomical purposes, the plant that supplied a type specimen of the species, is known as the type-plant (*vide infra*, on the labelling of Type-plants); and any specimen of this plant collected before or after the Proterotype-collection, is known as a Merotype. According to the status of the proterotype or secondary type derived from the plant, the Merotype can be more precisely described by such combinations as Meroholotype, Merolectotype, Mero-apotype, Meroneoholotype, etc. The definition of this term in Jackson's Glossary is not the same as that given by Dr. W. T. Swingle, the originator of the term, but it is applicable to Swingle's *Clonotype*—a term not included by Jackson.

If none of the original specimens studied by the author of a species was preserved, no proterotypes can exist. But a herbarium specimen from the type-plant, if collected subsequently by the author or someone else, would naturally fall into the Merotype category. In order, however, to indicate that no Proterotypes of the species exist, I distinguish as a Proteromerotype the Merotype first proposed as the standard of the species.

As, however, neither a Merotype, nor a Proteromerotype, can have entered into the original description of a species, they cannot be considered as Holotypes, Paratypes or Syntypes. For instance, take the orchids or the herbs which have been described

from living plants without preservation of herbarium material. Anyone, even the author of the species, who wished subsequently to take herbarium material from the type-plant, might have been misled into taking a specimen from the wrong plant, though somewhat similar to the one described. Now should a subsequent worker notice discrepancies between the herbarium material and the original description, the prefix Mero or Proteromero would at once put the worker on guard against the specimen. Besides, during the interval that must elapse between the taking of the original material and the Merotype, the type-plant itself may have grown more fully and have exhibited certain characteristics that were not visible in the original material and which, therefore, were not noted in the original description. In such a case, too, the prefixes, Mero and Proteromero, might prevent erroneous interpretation of the specific description and indicate the extent of the variability in the plant (*vide* also under Clastotype; and also the example under *Isotype*).

Example:—In the case of *Scirpus glaucescens* Willd., the basynym of *Heleocharis glaucescens* Schultes, mentioned in *Example 1* under Neotype, it has to be noted that the species was based on a plant growing in the Berlin Botanical Gardens. Presumably Willdenow drew his specific description from a living specimen which he did not preserve, and later he took, for his herbarium, material from a wrong plant mistaking it for the type-plant. If this surmise is correct, this second specimen should have been labelled as the Proteromertype, or more precisely Ideoproteromertype—a name that, had it been used by Willdenow himself, would have saved many controversies over the exact status of the species. For, as pointed out in the previous discussion of the case, (cf. under Neotype) the specimen that in Willdenow's herbarium bears Willdenow's specific name has been identified with a species (*Heleocharis palustris*) that has neither compressed stems nor trifid styles, characters which Willdenow expressly mentioned in the specific description of his *S. glaucescens*..

10. ISOTYPE:—A botanist, working critically on rare or taxonomically difficult plants, will naturally prefer to give all specimens taken simultaneously from one individual plant one field number and to the specimens taken in a similar manner from another plant another field number; even though both plants are of the same species and grow side by side, and both collections are taken on the same day and at the same hour. Now should a specimen from any of these collections become a Holotype, Lectotype, Apotype, Neotype, etc. respectively, the remaining specimens from the same collection will be of special value in any subsequent critical study of the species or to the other herbaria not possessing any of the original types, since they were all collected at one and the same time and from one and the same type-plant. Such duplicates are called by Swingle "Synchronous Merotypes", but I propose instead to restrict to them the use of the word Isotype and to call them respectively Isotype, Isoapotype, Isonotype, etc. as the case may be. The term Isotype, although originally proposed by Wilmott in the

sense of Swingle's Merotype, has recently come to be used rather indifferently to include all duplicates herein distinguished as Merotypes, Isotypes, Haptotypes and Clonotypes. (*vide* also under Clastotype).

Example:—In order to clarify the case of Merotypes and Isotypes further, I would refer to the system organised by Dr. F. H. Endert of the Boschwezen (Forest Department) in the Netherlands Indies, in order to secure adequate herbarium material of precisely such large forest trees as are likely to be omitted by ordinary "extensive" collectors. A forest official resident in a district selects and numbers a tree which is apparently typical of a species in a division of his district. In the flowering season the tree is climbed and enough material for 5 herbarium specimens is collected. Later, when the fruit is formed, the tree is felled and from it five fruiting specimens together with timber sections are taken. Now the question arises: Should both the flowering and fruiting specimens receive the same field number? Though both collections must receive the same *tree* number, they should certainly not receive the same *field* number since they were not collected simultaneously, or, if given the same field number, then a letter or other sign should be added to distinguish them. Thus if flowering specimens bear the field No. 165, the fruiting specimens could be given the field No. 165-A.

But whether these two collections are given two different field numbers or the same tree number, or both, care should be taken to indicate that, in each collection, the duplicates are of the ISO-Class, while the fruiting specimens are *Mero*-class duplicates of the flowering specimens so that, should any of the specimens become, say the Holotype, Neotype, Apotype, or a Syntype of a species, the institutions in possession of the duplicates of the type will know exactly the relation existing between the type and the duplicates: that is, if a flowering specimen from this collection were to become say the Holotype of a species, all the other specimens from the same collection will be Isoholotypes and the specimens in fruit Meroholotypes; or vice versa, if a specimen in fruit become the Holotype, all the duplicates in fruits become Isoholotypes and the specimens in flowers Meroholotypes. (see also note under Haptotypes below).

11. HAPTOTYPES:—Collectors generally, but specially those who require to make many duplicates, cannot give as much care in preparing their duplicates as can a botanist making his Isotypes. Collectors often give the same field number to specimens collected in the same locality from a number of different plants, that is to say, from plants that appear to the collector to be conspecific, but which may not be. Now it has already been pointed out in the introductory discussion of the Varieties of Types that in some cases, as of certain palms, herbs, orchids, grasses, or fungi, such procedure may be the only means to secure specimens in sufficient quantities to make many duplicates and, at the same time, to prevent the numbering in the field from becoming excessive and valueless. In these circumstances it should not be surprising if some duplicates belong to another species than the Proterotype. When, therefore, there is no means of ascertaining whether the specimens bearing one and the same number were derived from the same individual plant (or clump in the case of tufted plants), the duplicates should be regarded with suspicion and should never be called

Isotypes. Therefore I propose the term Haptotype for such duplicates. Only a Haptotype certainly collected simultaneously from the type-plant should be called an Isotype.

Note:—Even when all the specimens of a collection have been derived simultaneously from a single clump or tuft, it is advisable to look upon the duplicates with suspicion unless such duplicates have been prepared carefully by a competent botanist. I make this note after having noticed several discrepancies in the case of duplicates of palm specimens derived from the plants cultivated in the Botanic Gardens, Buitenzorg, Java. There the authorities in charge of the gardens aim to keep the numbering of the cultivated plants as accurate as possible; yet despite their care they are not able to prevent the seeds of one species from growing in clumps of another closely related species. In consequence one may sometimes see a clump labelled as of one species containing stems of another closely related species that has grown there from self-sown seeds.

Example 1:—In *Flora Capensis* V, Section 1 (1910) 246, N. E. Brown published the new species *Orthosiphon Thorncroftii* N. E. Br. with Thorncroft's specimen in Kew herbarium numbered 3123 as a syntype. Dr. Maurice Ashby, who has made this species the type (=basynym) of his new combination, *Hemizygia Thorncroftii* (N. E. Br.) Ashby, has shown that a specimen bearing this number in the herbarium of the Transvaal Museum at Pretoria does not correspond with the syntype in the Kew herbarium but represents *Hemizygia transvaalensis* (Schlecht.), Ashby (*Journ. Bot.* LXXIII, 1935, p. 349 adnot.).

Example 2:—Ridley gave the number 5123 to some *Dæmonorops* specimens collected from more than one clump, no doubt in the belief that these clumps were all of the same species. Subsequently he submitted one specimen to Beccari, who determined it as *D. angustifolius* Mart. Accordingly, Ridley entered this name on all the remaining duplicates of the Hapto-class numbered 5123 in the Singapore herbarium. It now appears that most of these are *D. grandis* Mart. Presumably, Ridley regarded all these duplicates as equivalent like the duplicates of Iso-class, and thus was led to misinterpret *D. angustifolius* Mart. in both his *Materials* II (1907) and his *Flora* V (1925).

12. CLONOTYPE and SPERMOTYPE:—When a type collection is small and when it is difficult to transplant the type plant to a garden, every opportunity should be taken to propagate the type-plant vegetatively or by seeds and to take duplicates from its progeny. This practice is not uncommon in many botanic gardens, though the specimens thus derived rarely bear precise labels. To be accurate a specimen from such an offspring should be labelled either a *Clonotype*, if the offspring was raised vegetatively, or a *Spermatype* if it was raised from seed or spore. These terms, Clonotype and Spermatype, are useful also because they may enable one to decide with herbarium material whether or not a variation from the type is hereditary in the species.

13. CLASTOTYPE:—Taxonomically considered, the only equivalent duplicates are Clastotypes and Isotypes. No other

duplicates can be regarded as taxonomically equivalent since they were not certainly gathered at the same time as the original type and from the same type-plant. Merotypes and Clonotypes, although they stand next in importance as duplicates, may have the disadvantage of showing marked variations from the Proterotypes and Isotypes or they may have been taken from a wrong plant owing to a mistake in the identity of the type-plant. Particular care should be taken, therefore, to prevent such important duplicates as the Clastotypes, Isotypes, Merotypes, and Clonotypes becoming mixed during drying, transit, mounting, etc. To prevent mixing, numbered tags should be attached to the larger parts of specimens, and numbered capsules should include seeds, fruits, flowers, and other small components.

4. The Labelling of Type Plants in Gardens

Botanical gardens often have type-plants or their offspring in cultivation. It would be useful if these type-plants were correctly labelled in the garden and the particulars of their history and place were kept filed in the office records. If this course were followed, the importance of the plants would become at once apparent both to the curators and visiting botanists. Besides, if the field labels of a type-plant were lost, the record file would enable one to locate the plant.

This, of course, is merely a suggestion. Each institution has its own methods, adapted to its particular requirements. The suggestion is put forward merely to indicate one way at least whereby type-plants growing in a garden might be made more useful to systematists and less liable to be forgotten. As an instance, I may point out that the seed progeny of type-plants of *Livistona Woodfordii*, *Ptychosperma Sanderianum* and *Borassus Machadonis* are presumably all growing in the Botanic Gardens, Singapore, but owing to inadequacy of labels and records it is extremely difficult to identify with any degree of certainty the plants that were raised from the seed directly obtained from the Holotype-plant.

As to the terminology of the type-plants one can adopt with advantage the one proposed above for labelling the type-specimens. The term Holotype, Paratype, Syntype, Lectotype, Neotype, Apotype or Ideotype, when applied to a type plant, would show the nature of the type specimen which this type-plant had supplied. Furthermore, a plant collected together with the holotype-specimen, and which is believed to be of the same species as the holotype, might be called a Haptotype plant, or more precisely a Haptoholotype-plant. The offspring of a type-plant, would also be called by the designation of their respective parents with the added prefix *Spermo* or *Clono*, according to the derivation of the offspring by sexual or asexual propagation. Finally, by adding the number of the propagation, as 1, 2, 3, etc., the exact generation of any one of the progeny

would be ascertainable at a glance. Thus "Spermoholotype 3" would mean that the plant so labelled was of the third sexual generation from the holotype plant.

5. The Labelling of Type Specimens in the Herbarium

In conclusion, I would remark on the labelling of type-specimens in the herbarium. Several botanists seem to favour strongly a tiny label with a printed inscription to indicate each kind of type, while others go further and recommend special colours for the slips, or special coloured ink for the inscriptions (one colour for each kind of type). In fact these different kinds of printed slips are many times found included with the unmounted duplicates of types (antitypes) sent in exchange from other herbaria.

To my mind these tiny slips are often nothing but a great nuisance. They are easily dislodged not only during the transit of unmounted specimens but also later when the specimens are being consulted in the herbarium, poisoned or mended. Should any of the slips fall out of a bundle, what clue is there to its right place? Should any be misplaced in the herbarium, what indication is there even for a botanist to detect the error? And one has to bear in mind that, while these slips are intended to aid the trained botanists, all the work of mounting, poisoning, mending, etc. may be entirely in the hands of persons who scarcely comprehend "all the fuss that botanists make over wee bits of printed paper", which can be had in ample quantities in the stores, and which they can hardly distinguish from the ones sent by other herbaria to indicate that a specimen has already been poisoned. Needless to say, the work of mounting and mending herbarium specimens should be rendered as simple as possible, so that, in the event of labels falling out of a packet, the right place could be found with little difficulty even by the personnel of the mounting department; or when, as sometimes happens, a label is pasted on a wrong sheet, the mistake may be recognised and corrected by anybody consulting the specimens. But reliance on printed slips, coloured or not, only introduces into such instances a most discouraging confusion; and possibly a confusion that not even the botanist himself would find it easy to straighten out, while in some instances an initial error would most certainly go undetected unless the botanist consulting the specimen were himself to undertake a revision of the species paying particular attention to its history and that of its types.

On these grounds alone there is in my opinion a serious objection to the use of tiny printed slips. Instead, the terms Holotype, Paratype, Lectotype, etc. should be written by hand on the specimen sheet itself or on the label that bears the name and number of the specimen. But there are other grounds why the simple and direct method of writing down by hand should be encouraged, when recording the status of a specimen in a

herbarium. For one thing, writing is easier and quicker than searching for the appropriate slip, which is a labour likely to discourage botanists from recording on the specimen sheet any discovery they may make regarding its relation to a published species or plate, or even the fact that it was compared with any of the existing types. For another thing, these tiny printed slips have no place for date or even the initials of the person who made the comparison or study; and in a large number of cases, as with Lectotypes, Apotypes, Neotypes, etc., for instance, it is important to know who made the selection of the Lectotype from the Syntypes, or who compared a herbarium specimen with the Holotype, etc. But if the method of writing directly by hand is adopted and even if the writer has omitted his initials, it is often easy to recognise the handwriting. On the other hand, the bare printed slip may have been put by anyone without any expert observation through a mistake: it carries on the face of it no personal guarantee. Finally, how obscure might have been the history of many a classical type-specimen in the herbaria of Linnaeus, Lamarck, Jussieu, Banks, Delessert, Retzius, Wallich, Griffith and the rest and how different the interpretation of the species now ascertained to have been based on those specimens, were it not for the handwriting of the persons who studied the types?

No doubt to preclude entries directly on the herbarium sheets by incompetent persons, there is in force in many herbaria a regulation that all annotations should be made on separate slips of paper or determination-labels to be pasted or pinned afterwards on the sheet. These labels could obviously be used also to indicate the nature of the types. As for the unmounted duplicates to be distributed, the information about their nature could be entered directly on each label that accompanies the duplicate giving particulars about its collection number, collector, locality, date, etc., though even in these cases the above mentioned determination-labels would also be far preferable to the tiny printed slips.

When recording particulars of the nature of the type on slips or determination-labels, it is advisable to head the label with the collector's name and the collection number (or, if without number, the locality and date) followed immediately by the name of the species, *e.g.*

- | | | | | |
|----|---|--|---|---|
| 1. | { | König, South India
Poa amboinica L. emend.
Retz.
Nelectotype. sec. Retz.
<i>initials:</i> | } | in Retzius' Herbarium in
Lund. |
| 2. | { | <i>Vilmorin, from cultivated
specimens</i>
Pinanga maculata Porte <i>ex</i>
Lem.
Logo-apotype sec. Furtado
<i>initials:</i> C.X.F. 15-11-33. | } | in Wendland's Her-
barium in Berlin. |

- | | | | | |
|----|---|---|---|---------------------------------|
| 3. | { | <i>Ridley</i> , 9090
<i>Areca bongayensis</i> Furtado sp.
nov.
Haptoholotype
<i>initials</i> : C.X.F. 15-2-34. | } | in British Museum
Herbarium. |
| 4. | { | <i>Ridley</i> , on <i>Matang</i> , in <i>July</i> ,
1903
<i>Calamus conjugatus</i> Furt. sp.
nov.
Holotype. | } | in Herb. Singapore. |
| 5. | { | <i>Wallich</i> 4441
<i>Raphidophora peepla</i> (Roxb.)
Schott.
Neotopotype. sec. Furtado | } | in British Museum
Herbarium. |
| 6. | { | <i>Wallich</i> , 4441 <i>partim</i>
<i>Rhaphidophora peepla</i> (Roxb.)
Schott.
Hapto-Neotopotype or
Topotype sec. Furtado
C.X.F. 18-2-34. | } | in Herb. Kew. |

These entries will serve the double purpose of guiding the personnel of the mounting department in finding the correct sheet for a label, should it have become detached and fallen out of the specimen cover; and they will enable the systematist to detect mistakes at once should labels have been glued on wrong sheets.

REFERENCES

1. CHASE, A.—Some Causes of Confusion in Plant Names—*Journ. For.* XVII (1919) 159-162.
2. JACKSON, B. D.—A Glossary of Botanic Terms with their Derivation and Accent. London, 1928 (4th ed.).
3. MERRILL, E. D.—Type, Cotype and Topotype Labels—*Torreya* XVII (1917) 13.
4. SWINGLE, W. T.—Merotypes as a Means of Multiplying Botanical Types—*Journ. Wash. Acad. Sci.* II (1912) 220.
5. SWINGLE, W. T.—Clastotypes Clonotypes and Spermotypes, Means for Multiplying Botanical Type Specimens—*Op. cit* II (1912) 344.

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