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Author(s): James M. Schopf
Reviewed work(s):
Source: *Taxon*, Vol. 27, No. 5/6 (Nov., 1978), pp. 485-488
Published by: International Association for Plant Taxonomy (IAPT)
Stable URL: http://www.jstor.org/stable/1219900
Accessed: 15/08/2012 05:23

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TAXON 27(5/6): 485–488. NOVEMBER 1978

UNSTATED REQUIREMENTS IN NOMENCLATURE FOR PLANT FOSSILS

*James M. Schopf**

The manner in which scientific names are used in systematic study of taxonomic groups (taxa) is a specialistic field usually referred to as nomenclature. It involves agreed upon practical principles (such as the hierarchical model) and technical details that may involve only matters of convenience. Most of all the conventions of nomenclature express consistent and accepted methods of using nomenclatural language. Experience has shown that nomenclatural pitfalls exist which can lead to misunderstanding and commonly waste a lot of time. If our method of treating names is standard and consistent it provides an elegant and concise means of discussing more substantial questions about the relationships of taxa. Without heed to the conventions of nomenclature such a discussion is most likely to devolve into a wordy digression about subjective matters of expression. The correct use of nomenclature facilitates discussion of taxonomic relationship.

One of the principles of greatest concern involves the authoritative relevance of words used as names; in other words, the decision whether a name or class of names is appropriate for formal treatment within the nomenclatural system. Some obvious requirements of form and presentation are established in the International Code of Botanical Nomenclature but some requirements are only implied. Essentially these unstated requirements go without saying in the taxonomy of plants, such as the fact that scientific names apply formally only to groups of one or more individual organisms, that an individual organism consists of all parts of its life cycle with all parts equally entitled to its name wherever recognized, and that parts of the same connected specimen cannot properly be assigned simultaneously to more than one taxon of the same rank. Normally the unstated requirements pose no problem for people working with modern plants but they are likely to cause confusion for those studying fossil organic remains where the organismal relationship is less obvious. I do not believe a Code of Nomenclature should attempt to cover every contingency but a greater appreciation for the unstated requirements in scientific nomenclature may aid in understanding and rationalizing the application of names for groups of fossil plants.

Actually a group of similar life-cycle organisms generally is implied for every taxon that bears a valid scientific name. Thus the use of a scientific name provides a concise means of identifying many basic qualities of objects under consideration. Conversely, if a scientific name has validity, it implies existence of a group of organisms including all life-cycle stages that can be associated through critical evidence. A taxon may be represented by an individual specimen but significant taxa generally are represented by more abundant information. A species, for example, is a population of similar organisms that is relatively distinguishable from others in its projection through time. Usually the evidence derived from several or many individuals showing the same segment of the organic life cycle may be identified as referable to a species. Comparable stages provide the only source of comparable hereditary characters by which an identification can be made.

* Departments of Botany, and of Geology and Mineralogy, Ohio State University, Columbus, Ohio, 43210, U.S.A.

This reasoning applies equally to modern and to fossil plants but a more critical and discriminating policy is necessary where fossils are concerned. Incomparable life-cycle stages, howsoever suggestive in association they may be and regardless of wishful interpretation, cannot be identified by the same name without much supporting and objective evidence. Ordinarily such evidence is rare (one "organic connection" may *not* be enough) and prudence indicates caution regarding such judgments of group identity. Whenever a question of identity arises between two specimens that are somewhat dissimilar one may reflect whether two names, rather than one, will provide a more clearly scientific and unambiguous means of record and a basis for further taxonomic treatment. Unless it can clearly be decided that the history of characters inherited (biocharacters) is best recorded under a single name, it may be desirable to treat the allied group taxonomically as two or more. Regardless of these elements of decision, scientific names can apply only to taxonomic groups; they do not apply directly to any of the organic parts for which morphologic terms are appropriate.

It is common practice in paleobotany to speak as if stems or leaves or spores were directly given names. This view is incorrect nomenclaturally because stems or leaves or spores or other parts of plants all represent portions of some kind of organic life cycle which in its entirety comprises the individual plant. Any isolated spore coat carries the definite botanical implication of the existence of other phases that complete its life cycle, whether or not details or even the main events within the cycle can presently be suggested. The existence of a life cycle, as predicated on a spore (or a leaf, or a stem), is one of the essential considerations that justifies applying scientific nomenclature to a group of organisms represented only by a spore. Certainly if no such life cycle could be inferred the whole biological basis for taxonomic treatment would be demolished; fossil spores in that case could only be classed as 'inexplicable objects'. This obviously is not true and I conclude that some elision of expression commonly occurs in stating the nomenclatural operation as applied to fossil plants.

The essence of verbal functional elision in naming is suggested by the accompanying diagram. I do not suppose use of the abbreviated form will ever be eliminated and it is not important whether it is or not. The only important consideration is to recognize such an expression for what *it is* — an abbreviation of an expressed nomenclatural relationship — *not an expression of literal truth*. Even if an author seems to insist that a name applies only to a leaf (or similar plant part) it seems to me the more appropriate procedure is simply to regard this as a *mistake subject to correction and to treat the name as legitimate*, provided other requirements are complied with. Not only is this procedure most likely to be acceptable to the author of the name but it is the most likely course of interpretation by others. However, there is no question that a scientific name applies to a group of organisms (not to a group of plant parts) if it is to qualify as a relevant scientific name subject to provisions and treatment according to the Code.

All fossils (as well as herbarium specimens and other reference materials for taxonomic study) are incomplete representations of life-cycle stages of an organism. Some fossil specimens, however, occasionally show an unusual assembly of parts which convey new and significant information. Sometimes reports suggest that different taxonomic names apply to the different parts of the connected fossil assembly. Such procedure, of course, results in taxonomic nonsense. Consider, for example, that the fruits of genus *Quercus* cannot possibly occur in organic connection with the foliage of genus *Acer*. Anything suggesting that two taxa of generic rank could have grown within the same life cycle contradicts biogenetic law (principles of heredity).

Organic connection of plant parts serves as proof of a biocharacter correlation for one individual plant. The connected specimen can bear only a single legitimate name and can be assigned to only one taxon, even though biocharac-

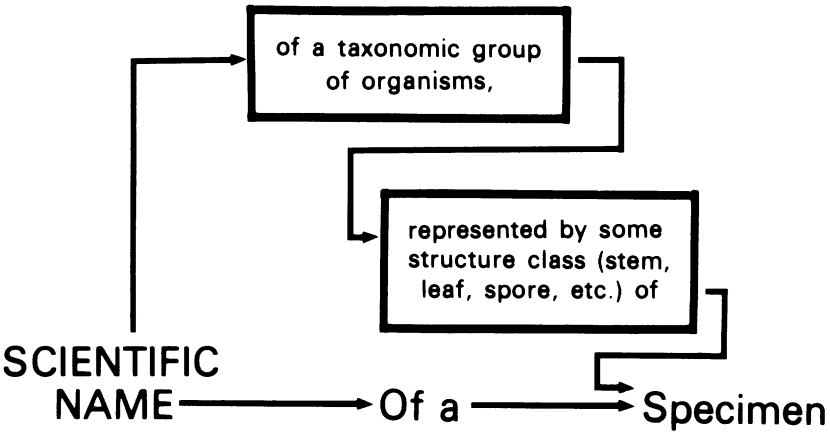

Figure. Verbal expression of the relationship of name to specimen:
(1) Above, fully implied elements of expression.
(2) Below, common form of expression, with elision.

ters characteristic of several genera may be shown in assembled connection. Such specimens are of great value because they serve to indicate the close and overlapping relationship between some types of fossils that usually occur in separation. A choice of taxonomic assignment is possible in such instances; preference for the taxon having the greater botanical significance is advised. Only identification, not a nomenclatural question of priority or synonymy, is involved. An important distinction is to be made between names hypothetically assignable, and a taxonomic identification actually made.

A question always arises, however, as to the time period that the specific hereditary features of such specimens have or will remain in a consistent correlation. One specimen may indicate that an intimately overlapping phyletic relationship existed between taxa usually treated as separate, but it does not define the duration of that alliance. Caution must be advised; duration is of essential importance in synonymy of taxa based on fossils. Until duration has been determined in detail it is most hazardous to imply that all of the less complete specimens, wherever found, are similar and should be identified together. Usually two names continue to be better than one for purposes of specific reference, but the circumference of the circle of probable relationship is reduced by a definite proof of correlation and this represents progress in evaluation of phylogeny. Thus the specimens that show correlation of multistructural parts are extremely important in establishing the relative value (relationships) of structural features, but it takes more than one specimen of organic connection to show the duration of correlated persistence of specific characters. Much correlational evidence is needed to relegate one name to disuse (positive synonymy) and actually show that the same taxon can be generally identified (through a span of geologic time) by use of only a portion of its diagnostic features. Common types of fossils are best identified by use of names that apply definitely and specifically. Definitive taxonomy cannot be based on conjectural and extended correlations of various plant parts.

There are other unstated corollaries in nomenclature. For example, a species name does not require consideration as legitimate if there is no indication that it ever had a nomenclatural type. Prior to 1958, type specimens need not to have been cited, so type specimens of older names may be obscure but usually the names can still be typified. By the same token, a generic name is to be questioned if it lacks at least one assigned species. Genera exist only as a

taxonomic group of one or more related species; if there are no species, there can be no genus. The doctrine I state here is logical and, I suspect, the only one that is tenable. Neotaxonomists have told me, however, that in some instances generic descriptions have been accepted as priorable although their publication antedated description of any included species. Unless accompanied by *some* indication that would lead to a type species it seems impossible, unless arbitrarily conserved, for such names to be priorable before a species is included. The initial publication of a generic name without mention of included species should usually be regarded as incidentally mentioned. Misunderstanding of this essential relationship has led to divergencies of date for establishing priority.

The problem of generic categories much referred to in paleobotany, the form genus, the organ genus and regular genus, is a topic that concerns many paleobotanists. I take the view that these kinds of genera are a good deal less important than some seem to think, because they always have been and continue to be subject to the varying interpretation of any taxonomist. A little research will show diversity and irregularity of usage but this diversity, although those who prefer to follow a group of special authorities may find it confusing, has not been a serious impediment. Of greater concern is whether any real and positive benefit is associated with use of these special categories in paleobotany. Regardless of any decision on this matter, the point of critical importance is that *taxa of all generic categories are designated, without preference, by legitimate nomenclature*. It should be a great source of satisfaction to know, whether or not there is a divergency of opinion about how the categories should be interpreted and applied, nomenclatural legitimacy can be objectively determined in every case and with this conclusion disagreement is unlikely.