

Phylogenetic Classification & the Phylocode

'For if a citizen in a free commonwealth may speak his mind, it will be at least allowed for me to state my principals among botanists! I have not reached such extreme of hardihood as to believe that all my reasoning is so firmly based, but that someone else may propound reasoning much more mature: still mine will be truer ***until some other principles are shown to be truer*** [my emphasis]. To you, my dearly beloved botanist, I submit my rules, the rules which I have laid down for myself, and in accordance with which I intend to walk. If they seem to you worthy, let them be used by you also; if not, please propound something better!'

Clasif. Linnaei M. D.

Methodus plantarum Sexualis in Sistematicae Naturae descripta (G. D. Ehret, ed). Leiden, 1736. p. 31.

"The suggestion that it may be as well to give up the attempt to define species, and to content oneself with recording the varieties of pelage and stature which accompany a definable type of skeletal and dental structure in the geographical district in which the latter is indigenous, may be regarded as revolutionary; but I am inclined to think that sooner or later we shall adopt it."

T.H. Huxley 1880

On the cranial and dental characters of the Canidae. Proc. Zool. Soc. 1880: 238.

Question Authority - Is there now a case for a range of different and explicit classifications that address different audiences? Undoubtedly, such classifications have existed for a long time but have had no scientific legitimacy. Do they now need some kind of formal framework? What would be the classifications associated with the following?

- the technological taxonomists (e.g., the molecular geneticist - electron microscopist)
- the professional field biologist (e.g., university teachers who take students into the field)
- the amateur field naturalist (e.g., members of local field clubs;)
- children (e.g., children on a field trip)
- collectors (e.g., shell collectors)

If there are different classifications, is there any area of overlap between them? Is there any area in which the museum expert is talking the same language as the school child, is talking the same language as the

field naturalist etc.? If there is a common ground, does it need examining and defining?

Some colleagues have argued that “... a classification, which has the most pedagogic value for my students, is not the one that is being developed in the cutting-edge taxonomic literature. Obviously, if the focus of the course IS this cutting-edge taxonomy, I should deal with it. However, if that taxonomy IS NOT the focus of the course, which taxonomy do I use? I need something that is not only fit-for-its-purpose but is also academically legitimate.”

Remember: All three schools of taxonomy have sought to produce **natural classifications**.

1. Phenetists view natural groups as those taxa linked by the greatest similarity to one another
2. To evolutionary taxonomists natural groups are delimited by morphological gaps between taxa and the distribution of characters for which an evolutionary scenario can be argued.
3. Cladists consider natural groups to be monophyletic, and natural classifications to reflect organismal history.

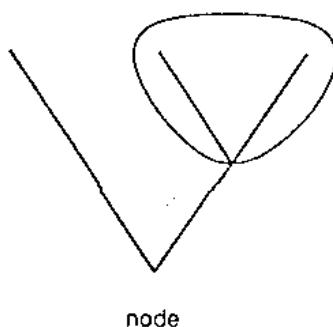
The current Linnean **ranked classification** scheme is reasonably compatible with the results of both phenetic and evolutionary taxonomic studies. However, it is inadequate in expressing the results of cladistic analyses. Here **unrank classifications** probably best reflect the nested sets of relationships that evolution has produced taxonomy.

A phylogenetic system of taxonomy has as its central tenet **evolutionary descent**. The Linnaean system has as its central tenets **priority, consensus, and stability**.

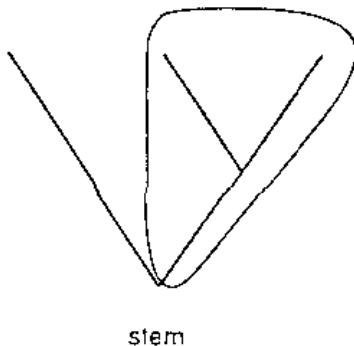
Should nomenclatural stability take precedence over information content of a classification?

Phylogenetic Classification

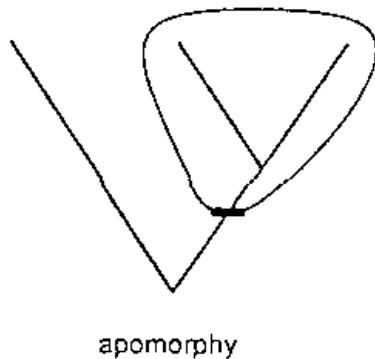
1. Taxon names are names of clades



Node-based: "the clade originating with the most recent common ancestor of A and B" or "the least inclusive clade containing A and B"



Stem-based: "the clade consisting of A and all organisms or species that share a more recent common ancestor with A than with Z" or "the most inclusive clade containing A but not Z."



Apomorphy-based: "the clade originating with the first organism or species to possess apomorphy M as inherited by A" or "the most inclusive clade exhibiting character state M synapomorphic with that in A"

These are just a subset of possible ways to name taxa phylogenetically (see Cantino et al. 1999; *Systematic Biology* 48: 790-807) for 10 more ways.

2. Synonymy

- A. currently tied to Linnean categories
- B. taxon names are synonymous if and only if they refer to the same clade

3. Priority

- A. currently tied to Linnean categories
 - B. priority in the phylogenetic system is not based on the first use of a name associated with a particular Linnean category, but on the first use of the name in association with a particular clade.
4. Unranked classification
- A. Avoids redundancy of names
 - B. Conventions



(<http://www.ohiou.edu/phylocode/index.html>)
(Ver. 4c January 2012)

The PhyloCode is based on ideas presented in the literature since the late 1980s (primarily by Kevin de Queiroz & Jacques Gauthier) and, more formally, on the outcome of a workshop held at Harvard University in August 1998.

The PhyloCode has been designed so that it can be used concurrently with the existing nomenclatural codes, although the scientific community might ultimately decide that the PhyloCode should become the sole code governing the names of taxa. At present the intent is to provide an alternative system, not a replacement.

The fundamental characteristic that distinguishes the PhyloCode from the conventional hierachic nomenclatural systems is its **ranklessness**. The PhyloCode covers the naming of clades *and species*, but in this system these terms refer not to ranks, but to different kinds of biologic entities. Both clades and species considered to be products of evolution that are discovered, rather than created, by systematists, and both have an objective existence regardless of whether they are named.

Principles of the PhyloCode (<http://www.ohiou.edu/phylocode/principles.html>)

1. Reference—The primary purpose of taxon names is to provide a means of referring to taxa, as opposed to indicating their characters, relationships, or membership.
2. Clarity—Taxon names should be unambiguous in their designation of particular taxa. Nomenclatural clarity is achieved through explicit definitions, which describe the concept of the taxon designated by the defined name.
3. Uniqueness—To promote clarity, each taxon should have only one accepted name, and each accepted name should refer to only one taxon.
4. Stability—The names of taxa should not change over time. As a corollary, it must be possible to name newly discovered taxa without changing the names of previously discovered taxa.
5. Phylogenetic context—This code is concerned with the naming of taxa and the application of taxon names in the context of phylogenetic concepts of taxa.
6. Taxonomic freedom. This code permits freedom of taxonomic opinion with regard to hypotheses about relationships; it only concerns how names are to be applied within the context of a given phylogenetic hypothesis.
7. There is no "case law" under this code. Nomenclatural problems are resolved by the Committee on Phylogenetic Nomenclature (CPN) by direct application of the code; previous decisions will be considered, but the CPN is not obligated by precedents set in those decisions.

Additions

There is now a companion volume to the *PhyloCode*, tentatively titled *Phylonyms: a Companion to the PhyloCode*. The names and definitions published in the companion volume will be the first to be established under the *PhyloCode* and will have priority over subsequently defined names. The definitions and associated protogues will also serve as models for future users of phylogenetic nomenclature. The companion volume should ideally include definitions for all widely used names—i.e., the large and/or deep clades that are commonly discussed in textbooks and other works for non-specialists. However, it is inevitable that some groups (e.g., vertebrates, angiosperms) will be more thoroughly covered than others (e.g., insects) because there are more specialists who are not only knowledgeable about the phylogeny of the group but also proponents of phylogenetic nomenclature.

Before the *PhyloCode* can be implemented there also needs to be a more modern way to track names through their registration; the registration database has come to be known as *RegNum*. *RegNum* will be an online database and will be integrated with several tools and data repositories (e.g., *TreeBASE*) that will enhance its relevance for phylogenetic research.

Membership in The International Society for Phylogenetic Nomenclature is open to all.
(www.phylonames.org)