Monophyly vs. paraphyly in plant systematics

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In the February number of this journal, Nordal & Stedje (2005) and 148 others (hereafter NS148) have vehemently argued for including paraphyletic taxa in classifications (for historical perspective, see e.g., Brummitt, 2002; 2003; and Nelson & al., 2003, for a response). With the great authority that NS148 authors might appear to wield within the botanical world (cf. NS148’s names and “geographical distribution”), much confusion may result. Our remarks below are not an exhaustive discussion (the reader is invited to search the taxonomic literature since Hennig, 1966, and reflect for him/herself), and we will restrict our comments to a few major concepts.

1. Pseudo-war—monophyletic groups versus Linnaean taxonomy and binomial nomenclature.

— Linnaean taxonomy (see editor’s footnote in Brummitt, 1997) is not necessarily connected directly with binomial nomenclature because each was created independently. As clearly stressed by a number of authors (e.g., Keller & al., 2003; Nixon & al., 2003; Wheeler, 2004), our “traditional system of classification” (= hierarchy with ranks) is not incompatible with a system in which names are given only to monophyletic groups. In addition, Nelson (1973) claimed that the purpose of expressing phylogenetic relationships is exemplified by hierarchical classification, and distinguished between the two ways generally used for representing the Linnaean (= Aristotelian) hierarchy—subordination and sequencing. Further, there is no logical connection between assuming a phylogeny-based classification and abandoning binomial nomenclature (Nixon & al., 2003). NS148 confuse these two very different themes and their misunderstanding undermines their own arguments. The “quasi–war” voiced by NS148 simply does not exist.

2. Pulverizing the products of evolution.

NS148 suggest that considering only “strictly monophyletic” groups is a logical impossibility. First, there are no “degrees” of being monophyletic and, therefore, a group either is or is not monophyletic. Second, there is no logical impossibility in considering only monophyletic groups. NS148 confuse logic with the possibility of large numbers of names that could result from a subordination scheme of phylogenetic classification (see Nelson, 1973), were the author of that scheme to name and attribute a rank to all monophyletic groups. They fail to recognize that not all and every monophyletic group must have a formal name (Nixon & al., 2003) as is already common practice (e.g., Eudicots and Asterids). They seem unaware of the current recommendations for phylogeny-based classification (e.g., Backlund & Bremer, 1998).

3. PhyloCode—the bad baby.

— NS148 take the PhyloCode as a unwelcome offspring (perhaps now a “bad boy” or even a bête noire, given its age) resulting from assuming phylogenetics as an underlying theory for classification. This is a false assumption. The promoters (e.g., Cantino & de Queiroz, 2004, and references therein) of the PhyloCode are, so far as it can be known, workers whose ideas about nomenclature are not endorsed by most practicing systematists for reasons discussed elsewhere (Nixon & Carpenter, 2000; Withgott, 2000; Carpenter 2003; Dyke & Sigwart, 2003; Stevenson & Davis, 2003). We emphasize that the very good reasons for basing a classification on phylogeny have absolutely nothing to do with adopting the PhyloCode (Nixon & al., 2003; Wheeler, 2004).

4. Non-phylogenetic new-speak, information content, and chaos.

— NS148 claim that “the rise of cladistic thinking in the last 40 years has promoted an obsession with monophyletic taxa, with classification based solely on descent at the expense of modification”. This phraseology may, at best, be interpreted as though cladists consider only cladogenesis (branching patterns) but not anagenesis (modification along the branches). This is a simplistic and inaccurate description of the phylogenetic approach to classification that was used often in the 1970s by the advocates of non-phylogenetic schools (e.g., Mayr, 1974), and is of no value to the matters at hand. How could any group be recognized if no modification (or more adequately, no difference in character states) can be detected? The decision whether and which clade to name is arbitrary. As a matter of practicality, most cladists opt to name those taxa with significant differences just as good taxonomists always have done. NS148 again ignore the mainstream literature of phylogenetic methods.

Another unsubstantiated claim by NS148 is “When a new set of characters has arisen within a group, [...] it
would leave the remainder of the parental group par
aphyletic, or one must split the remainder of the parental
group into different taxa even though there are no char
acters to recognize them”. This assertion has many im
plications, most importantly the information content of a
classification. What is the information that can be
retrieved from a paraphyletic group (e.g., Platnick, 1978;
Farris, 1979)? Which, if any, character state can define
such group (e.g., “Dicotyledons”)? Put another way,
which information on character states can be drawn
from “Dicotyledons” that uniquely defines this taxon (see
Farris, 1977, 1979, for detailed discussion on infor
mation content)? The paraphyletic group “Dicotyledons”
does not describe the distribution of any feature whatso
ever and, therefore, supplies no prediction (or retrodic
tion content)? The paraphyletic group “Dicotyledons”
that uniquely defines this taxon (see
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As one can note from the above, possible chaos in
taxonomy may result from the adoption of non-mono
phyletic groups, and not from the opposite. NS148’s play
on words will not frighten the attentive reader; phyloge
netic methods will not, in a “Jack-the-Ripper fashion”,
be pulverizing “families, genera and perhaps even spe
cies”, as NS148 have suggested.

5. Is Linnaeus still our brother and Aristotle
our father? — As clearly stated by Wheeler (2004:
507) “simplicity and practicality has sustained Linnaean
nomenclature and made it nearly equally useful to
Creationists, Quinarians, Evolutionary Taxonomists,
Pheneticists, Cladists and any New-New Systematists”. Further
more, Linnaean taxonomy (= hierarchy with ranks) has provided an effective, efficient language for biologists to organize the immense acquisition of information about the biodiversity for more than 200 years (Dyke & Sigwart, 2003). Therefore, it is evident that phylogenetic classification can be successfully integrated with our “traditional system of nomenclature” (= hierarchy with ranks). We can not know the future, but as always, lo and behold, Linnaeus is still our brother and Aristotle is our father (just in hierarchy)!

6. “The final cut”. — Before we enter into a the
oretical battle, such as this one, we have to be aware of the
historical, methodological and conceptual dimen
sions of the argument. The dangers of ignoring these are all too evident in NS148’s letter, which contains illogical arguments, misrepresentations of current practice and history, and ignorance of relevant literature.

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LITERATURE CITED


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