

of cladistic principles. Character polarity is determined primarily through outgroup comparison. Because of uncertainty about the identity of the outgroup, separate analyses are conducted in relation to five possible outgroups: Gentianales, Polemoniales, Campanulales, Loasales, and the Cornalean "core-complex" (sensu Philipson). Whichever is used, there are more synapomorphies uniting the Lamiales with the Scrophulariales than with the Boraginaceae. The few apomorphies shared by the Boraginaceae and Lamiales are structurally related and could be considered a single trend in gynoecial morphology, whereas those shared by the Scrophulariales and Lamiales pertain to a wide variety of vegetative and floral structures as well as phytochemistry. It is concluded that the hypothesis linking Lamiales and Scrophulariales as sister groups is better supported than that linking Lamiales with Boraginaceae.

CLARK, CAROLYN A. Forestry and Range Projects Office, Lockheed Engineering and Management Services Company, Inc., 1830 NASA Road One, Houston, TX 77258. - The ligule - a scanning electron microscope study of a morphological character used in grass systematics.

The ligule is a morphological feature characteristic of leaves of most but not all grasses (Poaceae). It is a membranaceous or ciliate collar-like appendage or rim present on the adaxial surface of the grass leaf.

Ligul Clark, Curtis. 1982. Relationships between experimental and phylogenetic systematics: An overview. Botanical Society of America, Misc. Ser., Publ. 162.

taxa. data and scanning electron micrographs of ligule types in various groups of grasses and investigates their usefulness as a taxonomic character in differentiating closely related taxa. The ligule appears to be a character that, used in conjunction with other gross morphological characters, may quickly differentiate very similar appearing *Dichanthelium* species from *Panicum* taxa.

CLARK, CURTIS. Biological Sciences, California State Polytechnic University, Pomona, CA 91768. - Hybridization in *Encelia* (Compositae: Heliantheae) and its effect on phylogenetic analysis.

Natural F₁ hybrids are common in *Encelia*; one combination is distinctive enough to have been mistaken for a species and named. In addition, several species appear to have originated from the stabilization of diploid hybrids. Phylogenetic analysis performed on all fifteen species resulted in cladograms with unresolved trichotomies and a high average character incongruence, suggestive of convergence. When five species of postulated hybrid origin were removed, the resulting cladograms had fewer trichotomies and lower average character incongruence. Three of the species of hybrid origin involve two parents that are sister species, and they behave in the predicted fashion, forming polytomies with one or both parents. The other two species of hybrid origin involve parents that are not sister species. That they are of hybrid origin cannot be inferred from the cla-

dograms. These examples illustrate the following points: (1) Inclusion of hybrids in a phylogenetic analysis can lead to increased character incongruence, (2) since species of hybrid origin need not be precisely intermediate between their parents, nor need their intermediacy be reflected by the characters chosen for analysis, their inclusion may not affect cladograms in predictable ways, and (3) speciation through hybridization cannot be inferred from phylogenetic analysis alone.

CLARK, CURTIS. Biological Sciences, California State Polytechnic University, Pomona CA 91768. - Relationships between experimental and phylogenetic systematics: an overview.

The methods of experimental plant systematics, as practiced by several generations of botanists and expounded in a multitude of papers, are compatible with the principles of phylogenetic (cladistic) systematics, and indeed are capable of providing much useful information. Four specific types of study, and their relationships to cladistic analysis, are considered: (1) Concordance of phylogenies generated from chromosome repatterning information with cladograms derived from shared apomorphies; (2) Usefulness of hybridization in elucidating homology; (3) Inappropriateness of "crossability" as an estimate of relationship; and (4) Usefulness of characters with simple inheritance in reconstructing phylogenies.

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taceae). at prim- as (e.g., nine, and nordenine) which are known to vary qualitatively among those species which have been examined. We have developed a system utilizing high performance liquid chromatography for the rapid and sensitive detection of these compounds in crude extracts. Differences between distinct species, such as *M. microcarpa* and *M. viridiflora*, are immediately detectable. However, we have found that taxa of questionable status manifest chemical profiles that are indistinguishable from those of other, well-accepted taxa. For example, *M. microcarpa* var. *auricarpa* and *M. microcarpa* var. *microcarpa* occur side by side in some populations, differing by the inconsistent morphological features of fruit and spine colors. Their alkaloid constituents are identical. We conclude that these taxa are synonymous. Studies of alkaloids prove very useful in resolving taxonomic difficulties in *Mammillaria*.

COILE, NANCY C., and SAMUEL B. JONES, JR. Botany Department, University of Georgia, Athens, GA 30602. - Systematics of *Lychnophora* Mart. (Compositae: Vernoniaeae).

Consisting of eleven species of shrubs, the genus *Lychnophora* is endemic to the Brazilian Planalto. *Lychnophora* is characterized by its syncephalous heads and by features of the achenes and pappus. The speciation patterns of the genus will be discussed. Additionally, the morphological variation will be examined in an attempt to determine the relationships of this genus with other genera in the tribe Vernoniaeae.