

Merits and Demerits of Cronquist's Classification

Merits

The classification of Cronquist is largely based on principles of phylogeny that find acceptance with major contemporary authors. The system is merited with the following achievements over the previous systems of classification:

❖ **Conformity with other Contemporary Classification:**

It shows general agreement with major contemporary systems of Takhtajan, Dahlgren and Thorne (earlier versions), and incorporates evidence from all sources in arrangement of various groups. *Paeonia* and *Nelumbo* are thus placed under **Paeoniaceae** and **Nelumbonaceae**, although the orders Paeoniales and Nelumbonales are not recognized. *Eucommia* is also kept in a separate family Eucommiaceae under a distinct order **Eucommiales**.

❖ **Publication in English language:**

The text, being in English, has been readily adopted in books and floristic projects originating in the USA.

❖ **Highly Phylogenetic Classification with proper placement and treatment of many groups:**

The system is highly **phylogenetic** and is based on now largely accepted phylogenetic principles in comprehensive form, giving detailed information on phytochemistry, anatomy, ultrastructure and chromosomes besides morphology.

The placement of Winteraceae at the beginning of dicotyledons is generally favoured by most authors including Ehrendorfer (1968), Gottsberger (1974) and Thorne (up to 1992). The family has vesselless wood similar to gymnosperms, great similarity between micro- and megasporophylls, unifacial stamens and carpels, morphology similar to **pteridosperms**, high chromosome number suggesting long evolutionary history and less specialized beetle pollination as compared to the genus *Magnolia*.

Placement of Magnoliidae as the most primitive group of angiosperms dicotyledons before monocotyledons, Magnoliales at the beginning of Magnoliidae and Butomaceae at the beginning of Liliopsida, finds general agreement with other authors. Compositae in dicotyledons and Orchidaceae in monocotyledons are generally regarded as advanced families, and are rightly placed towards the end of each group, respectively.

The separation of Brassicaceae and Capparaceae has found support from chloroplast sequence data (Hall, Sytsma and Iltis, 2002), consistent with morphological data.

❖ **Proper representation of relationships by diagrams:** The relationship of various groups has been depicted with diagrams, which provide valuable information on relative advancement, cladistic relationship and size of various subclasses.

❖ **Omission of Artificial group and Nomenclature according to ICBN:**

Abolition of artificial group names such as Polypetalae, Gamopetalae, Lignosae, Herbaceae etc. has resulted in more natural grouping of taxa. Verbenaceae and Lamiaceae are thus brought under the order **Lamiales**. Caryophyllaceae, Chenopodiaceae and Portulacaceae are similarly placed in the same order **Caryophyllales**. **Nomenclature** is in accordance with the International Code of Botanical Nomenclature.

Demerits

The system is becoming increasingly popular, especially in the USA, where many books are following this system. The following draw-backs, however, may be pointed out:

❖ **Not Useful in Identification:**

In spite of being a highly phylogenetic and popular in the USA, the system is not very useful for **identification** and adoption in herbaria since identification keys for genera, their distribution and description are not provided.

❖ **Treatment of Angiosperms**

Dahlgren (1983,1989) and Thorne (1981, 2003) considered angiosperms to deserve a **class** rank, and not that of a division. The monocotyledons are placed after dicotyledons, whereas the recent classifications place them between primitive angiosperms and the eudicots.

❖ **Placement of Monocot and Dicot:**

Most recent authors do not believe in the aquatic ancestry of monocotyledons. Kosakai et al., (1970) have provided ample evidence to refute the aquatic ancestry of monocotyledons on the basis of study of primary xylem in the roots of *Nelumbo* (Nymphaeales). Cronquist believed that mono-cotyledons arose from vesselless ancestors resembling presentday Nymphaeales. Dahlgren et al., (1985) point out that Nymphaeales and Alismatales demonstrate a case of **multiple convergence**, and only a few characters (sulcate pollen grains and trimerous flowers) are due to shared ancestry. The presence of two cotyledons, S-type sieve tube plastids, occurrence of ellagic acid and perispermous seeds in Nymphaeales argue strongly against their position as a starting point of monocotyledons, and none of these attributes occur in Alismatales.

❖ **Improper Placement of Various taxonomic groups:**

Asteridae represent a loose assemblage of several diverse sympetalous families. Clifford (1977) on the basis of numerical studies has shown that Typhales are better placed in Arecidae. Cronquist places Typhales in Commelinidae.

Hamamelidae do not represent an ancient side-branch of Magnoliidae but are remnants of a transition from Magnoliidae to Dilleniidae-Rosidae-Asteridae.

Behnke (1977) and Behnke and Barthlott (1983) advocate that *Polygonales* and *Plumbaginales*, with S-type plastids, should be re-moved to **Rosidae** and only Caryophyllales with PIII-type plastids retained in Caryophyllidae.

Urticales are placed in Hamamelidae together with wind-pollinated families, whereas they are close to Malvales and Euphorbiales (Dahlgren, 1983,1989). Cronquist further separates Malvales in Dilleniidae and Euphorbiales in Rosidae.

Metcalf and Chalk (1983), on the basis of a unique combination of anatomical features, suggested that family *Dioncophyllaceae* should occupy an isolated taxonomic position, but it was placed by Cronquist in order Violales before family Ancistrocladaceae.

Cronquist (1988) recognized Physenaceae as a family under Order Urticales, but was not sure about its exact placement.

The family *Winteraceae* is placed towards the beginning of Magnoliales and Canellaceae towards the end. The multigene analyses (Soltis et al., 1999; Zanis et al., 2002, 2003) have provided 99-100 per cent **bootstrap support** in their relationship. The two are accordingly placed in a separate order in APG II and APweb, and under the same suborder in Thorne (2003). The affinities between these two families is also supported by morphological studies of Doyle and Endress (2000).

❖ **Not recognizing Super-orders**

Superorder, as a rank above the order, is not recognized, thus showing a significant departure from the contemporary systems of Takhtajan, Thorne and Dahlgren.

Ehrendorfer (1983) pointed out that