

Floral morphology and distribution of the *Epidendrum ellipticum* complex (*Orchidaceae*) in Brazil

Květní morfologie a rozšíření komplexu *Epidendrum ellipticum* (*Orchidaceae*) v Brazílii

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The *Epidendrum ellipticum* alliance is a critical group among the Brazilian orchid species due to wide variability in the morphology of the flowers. Results of more than 250 floral analyses carried out with the improved method of Alves from 1990 are presented. Material analysed was collected in the field over a period of five years. Attempts to correlate some variations with environmental factors have been made. The present paper is preliminary.

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INTRODUCTION

The genus *Epidendrum* L. has 107 species recognized for Brazil by PABST et DUNGS (1975, 1977). Of these species certain groups naturally tend to form alliances in which they can be more or less securely identified. One alliance with a very complex variability is that of *Epidendrum denticulatum* B. RODR., *E. ellipticum* GRAHAM, etc. The attempts to separate this group artificially have failed so far.

With the floral analysis method the taxonomy of tropical orchids in South America advanced rapidly in the seventies. Many constant taxa have been described satisfactorily and still others remain as problematical as the *E. ellipticum* alliance. Satisfactory results in their classification should arise from the combined identification methods which should separate the taxa into natural species and hybrids and elucidate other differences. For such a system many years of combined probing into the caryotypes, ecology, anatomy and morphology will be necessary. Moreover there is no proof that this wild diversity of floral forms is not a result of our rapidly changing atmosphere, thus of very recent creation. This possibility would explain why the otherwise very observant authors from the turn of the century failed to see this variability. That in mind, I intend the present paper merely as a contribution to the knowledge of this taxonomical problem.

The genus has many problem groups for the classical taxonomical approach, besides many well stabilized and easily recognizable species. For example *E. rigidum* JACQ. ranges from southern South America to Mexico with almost no variability, as confirmed by a lot of herbarium specimens I collected and saw in herbaria as W, WU, RB, SPF, OUPR etc.

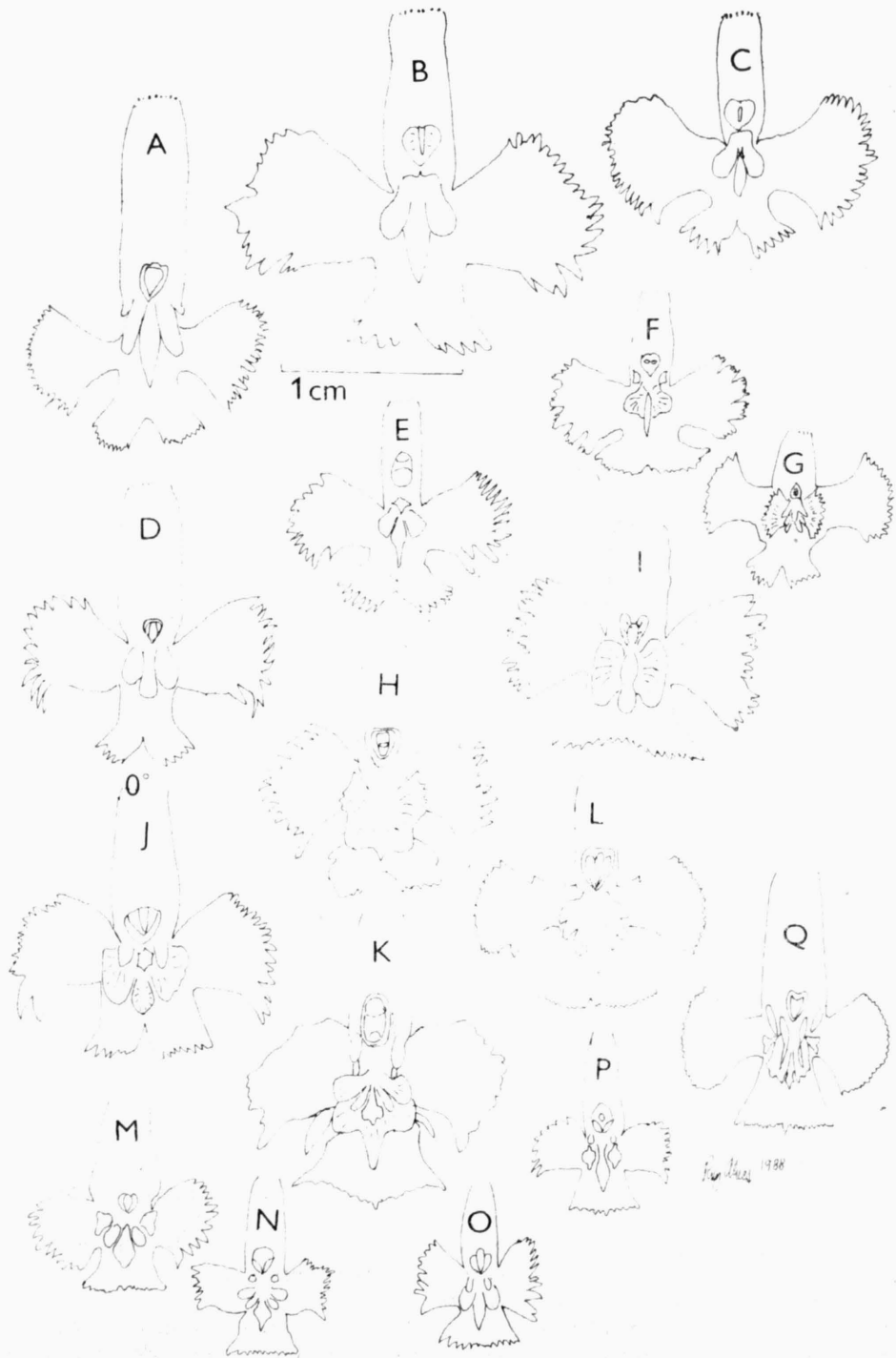


Fig. 1. — *Epidendrum ellipticum* alliance partial floral analyses from different locations in Brazil showing only the labellum of each group. Taxon M is indicated as nonresupinate, all other taxa are probably resupinate.

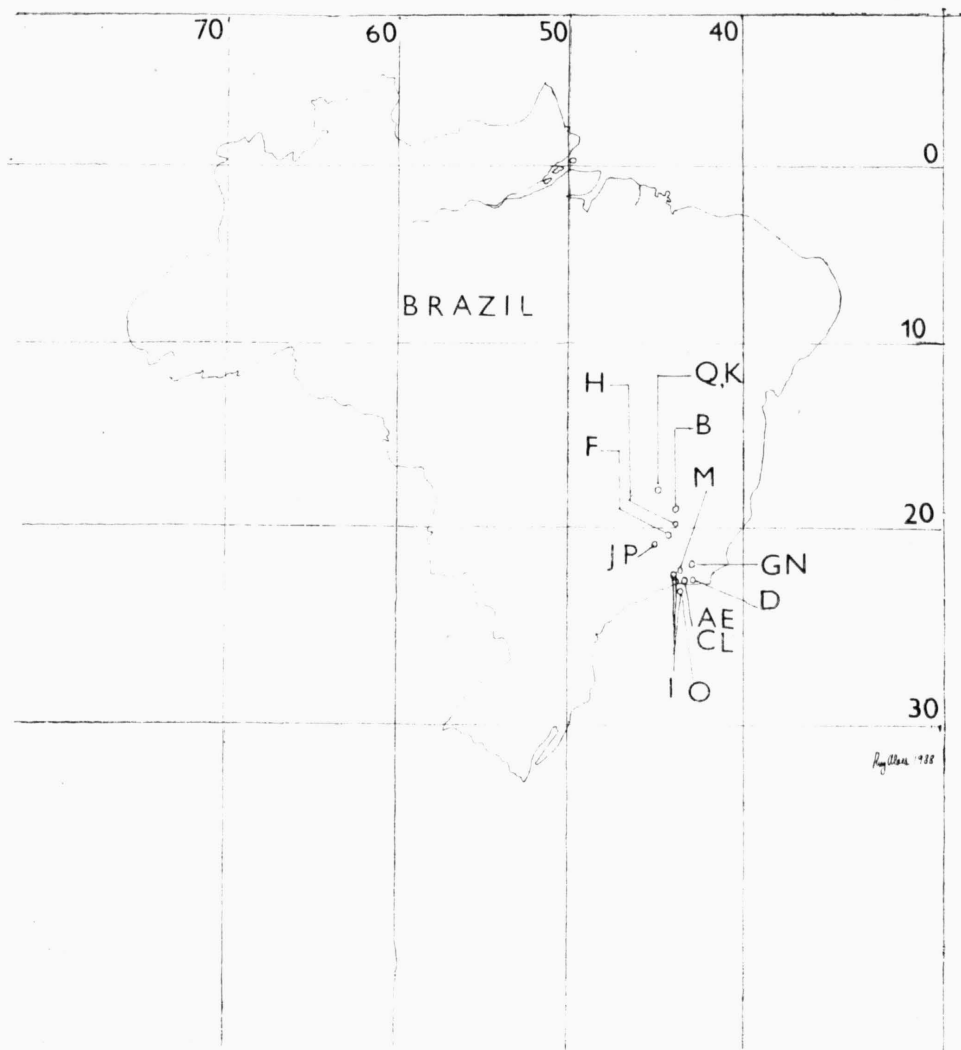


Fig. 2. — Map of locations where the taxa from Fig. 1 were found most commonly. Other taxa, (not indicated in the figure) occurred in lesser proportions, rather as individuals than as populations.

METHODS AND MATERIALS

During five years, ending in 1988, flowers of the *Epidendrum ellipticum* alliance were collected sporadically on field trips in the states of Minas Gerais, Rio de Janeiro, Goiás, and São Paulo. They were preserved in 70 % ethyl-alcohol and saved with their regular field data. Flowers from all specimens collected in the field were analyzed by a strict method of floral analysis (ALVES 1990). The flowers were collected both in the field and from the specimens brought for cultivation. Over 250 analyses were made in the complex.

The morphological characters were taken basically from the labellum and column. All floral analyses were sorted into morphologically and anatomically similar groups and subgroups according to the length of their column, calli and lateral lobes, the denticulation and width of the lateral

lobes, and the division of the apical lobe of the labellum. The groups that appeared most commonly and which tended to form populations were illustrated.

Not all groups which occurred in many distant sites tended to form dense and well defined populations (Fig. 2).

CRITERIA OF DIFFERENTIATION

The most important criterium of differentiation for allied Brazilian orchids has so far been the floral analysis, which reveals in great detail the morphological and some of the anatomical differences among the flowers of species. The first monograph for Brazilian orchids based on this method is that of PABST et DUNGS (1975, 1977).

As secondary characters for the *Epidendrum ellipticum* complex one may consider the pigmentation on the calli of the labellum, color and shape of the anther cap, and the relative size of the flowers. The size as an absolute value to the nearest mm can be misleading due to variations within the individual species caused by environmental conditions.

Resupination in orchids is a complex phenomenon see PILJ et DODSON (1966), but in this taxon many otherwise identical species are found in both resupinate and nonresupinate forms, (Fig 1 — A, L, and O). Only one taxon, (Fig. 1-M), was found only with superior labella, both nonresupinate and doubly resupinate.

A very variable structure in both coloring and shape is the anther, which shows various forms for otherwise identical taxa. The column is relatively short (Fig. 1 — G and M) and has darker purple stripes on either side (Fig. 1 — F). The overall coloring of the flowers in these taxa varied only in intensity of a pinkish violet hue.

PABST et DUNGS (1975) published the floral analyses of what they understood to be separate species in this aggregate, but a few of the illustrations resemble mere drawings of flowers rather than analyses. Fig. 3 shows some of these drafts which have been redrawn, being the unimportant structures such as sepals left out.

According to the illustrations in PABST et DUNGS (1975), it seems easy to identify and securely distinguish *Epidendrum denticulatum* from *E. ellipticum*, see Fig. 3 — (1 and 3). Closely related taxa to both these basic "species" are very frequent. Under *E. denticulatum* my files provided taxa like Fig. 1 — (A, B, C, D and G) while under *E. ellipticum* I found those shown in Fig. 1 —

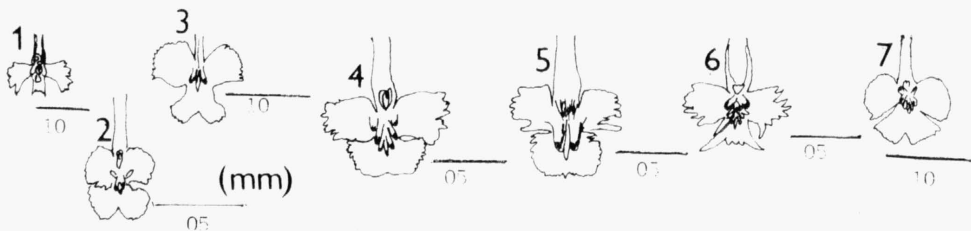


Fig. 3. — Floral analyses redrawn from PABST et DUNGS (1975). These taxa are indicated as: 1 — *Epidendrum ellipticum*, 2 — *E. herzogii*, 3 — *E. denticulatum*, 4 — *E. elongatum*, 5 — *E. crassifolium*, 6 — *E. xanthinum*, 7 — *E. longihastatum*. These and other allied taxa still have uncertain taxonomical positions.

(M, N, O, P, and Q). Whether such slight differences like the denticulation in margins of the lateral lobes of the labellum (Fig. 1— A and D) are of any use remains unanswered.

Lateral lobes may be attached to the labellum disc by wide (Fig. 1— B, E, and K) or narrow bases. Their margins may be rounded as in A, C, H, M, and Q or straight, with a saw-like denticulation as in A, L, and Q, or a few terminal teeth as in D, E, and H. Exceptionally the margin may be lobed bearing each lobe some five terminal teeth as in Fig. 1— (F). The lateral lobes may also be longer than the apical lobe as in A, B, and C, or as long as the apical lobe as in O.

The apical lobe may be whole, Fig. 1—(N, O, P, and Q), obscurely bifid (F), or explicitly bifid as in A, B, C,.... This central division may be deep (C, J) or restricted to the apex as in A, B, G, E, and H.

The calli may have the same color as the labellum or be contrastingly different. White is most common, followed by sulphury yellow which seems more common in individuals from higher altitudes (Fig. 1— F, G, N). Many times otherwise identical flowers from lower sites have the calli white.

The anthers in this complex taxon are very variable in format and even more in coloring. Heart-shaped and other forms appear, the most common ones being oval. The surface coloring varies from opaque brown to symmetrical shiny combinations of up to five contrasting colors. The most colorful anthers and calli belong to the flowers of plants from higher altitudes above 1500 m.

To show the diversity Fig. 4 illustrates five taxa (R, S, T, U, V) found in one site in the state of Minas Gerais. The taxa have been collected less than 100 m apart. The taxa J and P from Fig. 1 also proceed from this location. The style of floral analysis in Fig. 4 is more detailed, stressing the venation as well. A map of the locations where the taxa from Fig. 1 have been collected is shown in Fig. 2. The map was delineated only roughly through a tracing device.

POLLINATION SYNDROMES

PIJL et DODSON (1966) indicate that *Epidendrum* species have been observed to be ornithophilous or psychophilous. In fact hummingbirds were frequent visitors of the plants observed in nature, but this apparently had no relation to the morphology here expressed. The flowers with no resupination tended to have their lip and nectar column consequently also the nectar tube pointed upwards while the resupinate ones were at a horizontal position. In both cases the calli are probably functional as nectar guides and may also serve to elevate the bill or proboscis in order to touch the anther and viscid during the extraction of nectar.

If so, on the other hand, this elaborate set of calli seems to be only partly efficient in nature, for most of the inflorescences found on all specimens of this aggregate had only one or two developed capsules, contrasting with the high number of flowers they have in the entire season (over 100 flowers per scape, of which about 10 are open simultaneously and 3 of these seem receptive).

PIJL et DODSON (1966) also disagree with the excessive divisions done in some genera, claiming that different pollination syndromes are responsible for the distinction of such groups as *Laelia* and *Sophranitis*. PABST

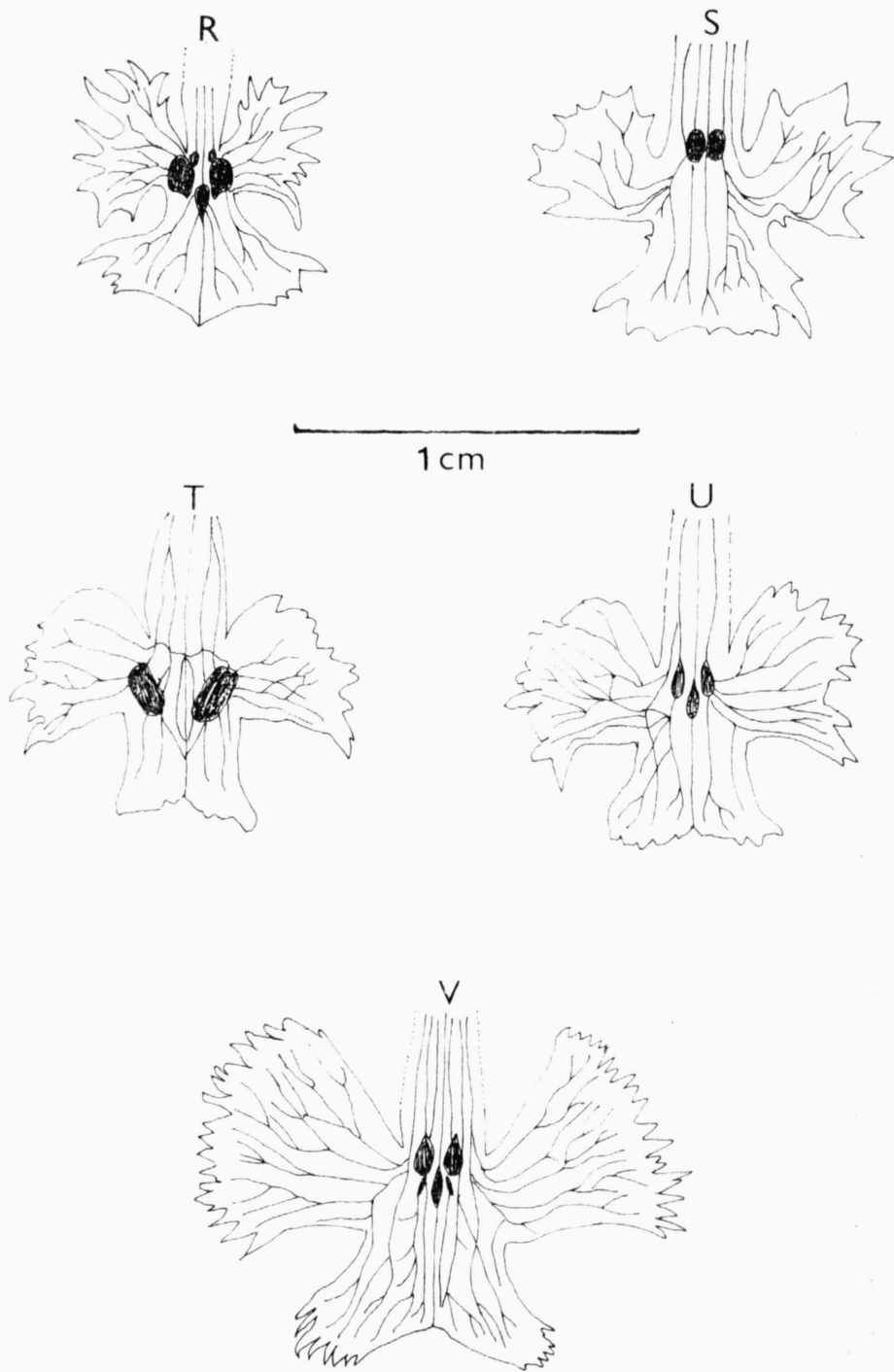


Fig. 4. — Labellum drafts of the floral analyses of plants from a site in Minas Gerais state. (Note these are more complete showing venation as well.) The specimens were found less than 100 m apart.

et al. (1980) provided some satisfactory evidence for distinguishing among *Epidendrum*, *Encyclia*, *Anacheilium* and *Hormidium*, these four genera being victims of a continuous taxonomical reshuffling in the past and present. Personally I agree with even further subdivisions whenever the need to distinguish among different groups arises. The degree of relation among the four above genera is high, but their distinction is practical and by far not artificial.

Acknowledgments

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SOUHRN

Mezi kritické taxony brazilské čeledi *Orchidaceae* patří i komplex *Epidendrum ellipticum* a *E. denticulatum*. Cílem práce bylo rozlišit taxony tohoto komplexu. Pětileté studium herbářových položek a vlastních sběrů (ze států Goiás, Minas Gerais, Rio de Janeiro a Sao Paulo) přineslo srovnání květních rozborů z 250 rostlin. Živé květy byly získány v terénu a kultivací. Největší variabilita byla zjištěna u pysku a sloupku, nejmenší v okvětních listech a listech. Kresby květních rozborů jsou seřazeny podle podobnosti morfologických znaků jako na obr. 1. Přes vysoký počet analyzovaných rostlin, květních rozborů i ekologických dat se doposud nepodařilo tento komplex úspěšně taxonomicky rozřešit.

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Cronquist A.:

The evolution and classification of flowering plants

Ed. 2. — The New York Botanical Garden, Bronx, New York 1988, 555 str., nečisl. foto a pérovky, cena 48.80 US dol. (Kniha je v knihovně ČSBS.)

Autora, prof. Arthura Cronquista, není třeba našim čtenářům představovat. V československých knihovnách se sporadicky vyskytují první vydání recenzované knihy i jeho „opus magnum“, *An integrated system...* Je to velký botanik; protože jsem měl možnost poznat jej osobně, mohu konstatovat, že je velký i v pravém slova smyslu: měří bezmála dva metry a působivost jeho zjevu násobí fakt, že téměř stále píše dunivým basem. Je vtipný a bystrý i při svých 70 letech, účastní se botanických i jiných polemik, váží si názorů svých oponentů, ale trvá na tom, aby byly respektovány i jeho názory. Všechny tyto vlastnosti se dají snadno vysledovat i v této knize, která v kostce předkládá teorii, o kterou se Cronquist opíral při psaní svého *Integrovaného systému*. Kniha je psána svěžím stylem plným metafor a polemických míst. Stačí jen citovat malý odstavce v Úvodu: „Tato kniha představuje taxonomii, jak ji vidí Cronquist. Pokouším se podat příběh, mající hlavu a patu a vyložit své názory na sporné otázky, ale nepředstírám, že dávám stejný prostor i názorům opačným. Chcete-li znát i jiné názory, čtěte jiné autory.“

V první kapitole jsou vyloženy základní principy a východiska taxonomie. Jsou definovány cíle taxonomie, pozornost je věnována znakům, jejich vážení či absenci, je probrán i pojem fylogeneze. Dostatek místa má zde i kladistika. Navzdory citované větě z Úvodu, Cronquist nás seznamuje se základními pojmy a metodami kladistiky, ačkoliv sám jejím velkým zastáncem není. Stranou není ponechána ani numerická taxonomie či Wagnerova metoda.

Následuje kapitola o druzích a infraspecifických jednotkách. Autor probírá historické i současné náhledy na kategorii druhu a ukazuje jejich omezenost. Mluví o biologickém, praktickém, ekologickém pojetí druhu a všimá si řady jevů, které mohou kategorii druhu specifikovat. Text je doplněn i fotografiemi známých botaniků, kteří významně přispěli k řešení otázky druhu (např. Stebbins, Clausen, Andersson, Keck, Hiesey). V řadě případů Cronquist zakládá své názory na americké taxonomické tradici. Projevuje se to zejména v tendenci taxony spíše spojovat než dále dělit a v nedocení kategorizace poddruhu.

V knize, jako je tato, nesmí scházet kapitola věnovaná speciaci. V krátkosti je zde probírána většina základních pojmů, se zdůrazněním důležitějších nebo sporných otázek a s potlačením detailů. Tato část knihy je vhodná spíše pro ty, kdo si nejprve přečetli hodně knížek o tomto tématu od jiných autorů. Přesto zde najdeme řadu pěkných ilustrativních příkladů různých typů speciace.

Čtvrtá a pátá kapitola je věnována původu krytosemenných rostlin a evoluci jejich znaků, což tvoří více než čtvrtinu textu této knihy. Celou druhou polovinu publikace pak zabírá systematický přehled vyšších taxonů Magnoliophyt. Pozoruhodné jsou klíče na určení čeledí i vyšších jednotek, řada ilustrací a hojnost novější literatury.

Závěrem lze říci, že kniha poskytne čtenáři nejen poučení (a záplavu nově seřazených faktů), ale i zábavu při četbě polemických pasáží. Je třeba zdůraznit, že se jedná spíše o četbu pro pokročilé, která nemá charakter učebnice. Některé odstavce sem asi nebyly umístěny na základě nějaké koncepce, ale prostě proto, že A. Cronquist potřeboval vyslovit své názory na ty či ony aktuální problémy taxonomie. To ovšem nebrání, abych přiznal, že jsem tuto knihu četl s chutí a že se mi líbí.

J. Kirschner