A New "Genera Plantarum"

For more than a third of a century, the name J. Hutchinson has instantly called to the minds of plant taxonomists, and to the minds of most other botanists as well, the two editions of the author's *Families of Flowering Plants*. Hutchinson's "Fam. Fl. Pl." is (or should be) on the desk of every practicing taxonomist; its useful keys are now part of taxonomic methodology. With what satisfaction, then, one opens the first volume of his awaited elaboration, which will carry to the generic level a comprehensive analysis of the classification of the living angiosperms.

Hutchinson has devoted his long botanical career to this conclusion, and he is perhaps the only man brave enough to venture a new *Genera Plantarum* modeled on the classic work of G. Bentham and J. D. Hooker. The heritage of botanical phylogenists passes from long generation to long generation, and Hutchinson in his preface, regretting that he did not meet Bentham, recounts his single meeting with Hooker. The famous "Hooker f.," then aged 90, could not have realized that he was passing his mantle to the young man of 22.

The monumental task to which Hutchinson in recent years has directed his efforts is projected to extend into ten volumes; the first volume, **The Genera of Flowering Plants (Angiospermae)**. Volume 1, *Dicotyledones* (Oxford University Press, New York, 1964. 528 pp. $20.20), which is reviewed here, came from the press in the author's 80th year. The botanical public will anticipate with great interest the remaining volumes, some of which are doubtless in various stages of final production.

Hutchinson invites comparison of his major work with the classifications proposed by the de Jussieus in France, the de Candolles in Switzerland, and Bentham and Hooker in England, stating his hope to revise and bring up to date their contributions. This most ambitious undertaking has the best wishes of plant taxonomists, who have attentively noted the author's successive publications since the first edition of his *Families of Flowering Plants, I. Dicotyledons* (1926).

The *Genera of Flowering Plants* (which will include only the angiosperms) will follow Hutchinson's phylogenetic system as expressed in the second edition (1959) of his *Families of Flowering Plants*. The points of difference between this and the first edition are well known to taxonomists and other students of angiosperm phylogeny.

Assuming that the present arrangement of orders and families is carried through the ten volumes, the entire work will discuss 111 orders, 411 families, and approximately 11,500 genera. Conservative taxonomists will consider these numbers somewhat overwhelming, but others will applaud Hutchinson's determination to seek morphological discontinuities where they exist and to recognize them without equivocation. As a matter of statistical information, one notes that Hutchinson's average order contains 3.7 families, and that his very largest order (Celastrales) includes only 19 families. The first volume, by including only 7 orders, would seem to be slimmer than the demanded average; but it covers 29 families and 1127 genera, and thus probably includes approximately 10 percent of the total volume of the task. Considerably more than half of the first volume is occupied by the single order Leguminales, with 691 genera; traditionalists again will be taken aback to note that the family Fabaceae is divided into 50 tribes.

Although generic descriptions are brief, the amount of information compressed into this first volume is very substantial. The author's knowledge of botanical literature is reflected in his succinct references; and his keys to genera, although terse and abbreviated, indicate familiarity with complex subject matter. There can be no doubt that the volumes of this major work, as they become available, will be avidly used by taxonomists seeking generic identifications. Specialists inevitably will find grounds for disagreement with respect to the delimitation of genera, families, and orders, but this fact in no way detracts from the conclusion that Hutchinson's work will usefully supplement its predecessors, Bentham and Hooker's *Genera Plantarum* (1862 to 1883) and Engler and Prantl's *Die Natürlichen Pflanzenfamilien* (1887 to 1898).

In his introduction, Hutchinson indicates his belief that classification and phylogeny must continue to be based mainly on gross morphology, expressing his impatience with those students versed in paleontology, cytology, genetics, and pollen morphology, but only vaguely familiar with taxonomy and nomenclature. This might be an admirable viewpoint if the age for personal visions in science were not behind us. Today, with the enormous resources of morphology, anatomy, cytology, chemistry, and other fields at the disposal of a phylogenist, personal perceptions are tolerable only insofar as they can be confirmed by evidence.

The problem of arranging in a linear sequence a group of concepts (orders, families, and genera) that in their evolutionary relationships are very complex has plagued and puzzled biologists. A phyletically correct sequence, of course, is impracticable, because countless evolutionary lines have been involved in the history of any "taxon." Only the lines that have successfully persisted to Recent times concern us in an account of the living angiosperms; and it is obviously impossible to reflect in any system a "correct" sequence. That no two students of the phylogeny of the angiosperms can agree in detail should alarm nobody. In a book of this nature it would be vain to seek corroboration of any reader's personal views.

Administrators of large herbaria have long hoped that some elaborate document would provide a logical sequence whereby all the angiosperms, at both the familial and generic levels, might be arranged in a single linear sequence, a sequence that embodied and updated the basic philosophy of Bentham and Hooker, but was expressed in the detail presented by Engler and his colleagues. Until such a publication appears, herbaria will probably remain arranged in one or another of those two sequences, with all their imperfections. Candor compels

me to suggest that Hutchinson's *Genera* is not going to provide the answer.

The concept that the most primitive extant angiosperms are to be found among the relatives, speaking very generally, of the magnolias and buttercups has sound support from modern studies, including research on such aspects as pollen structure, carpel and stamen morphology, and vessel elaboration. Most phylogenists of the past century, excepting only adherents of the "Englerian" school, agree on this basic concept, which indeed in the light of increasingly detailed studies of the past two or three decades is essentially incontrovertible.

Where Hutchinson departs from this voluminously documented concept is in deriving predominantly woody and predominantly herbaceous dicotyledonous families along two parallel evolutionary lines, termed by him the Lignosae and the Herbaceae. This theme, which must have taken possession of Hutchinson's botanical philosophy early in his career, is elaborated in the first edition of his *Families of Flowering Plants*. In the past 38 years he has persistently hewed to this line, through the second edition of the *Families* and now into the greatly elaborated *Genera*. Unmoved by revisionary studies that imply derivation of the "herbaceous" families from various "woody" families, all along complex divergent and reticulate evolutionary pathways, Hutchinson has followed the theme of his younger years with unflinching perseverance.

I shall limit my remaining remarks to the three orders initially treated as the Magnoliales, Annonales, and Laurales—the complex of families that often passes as the "woody Ranales." In number these families usually vary from about 15 to 26, depending upon the degree of inclusion of the student and his propensities for "splitting." Hutchinson recognizes 18 families in this complex, often believed to include the most primitive extant angiosperms. To divide the 18 families into three orders can only be arbitrary, as they fall into a greater number of alliances of one degree or another, among which are substantial anatomical and morphological discontinuities. The proposed sequence in many instances ignores the evidence that now has very general currency among students of these important and fascinating groups.

The Hutchinson sequence (Magnoliaceae - Illiciaceae - Winteraceae - Canellaceae - Schisandraceae - Himantandraceae, and so on) is not logical. In whatever sequence one lists the groups, it is imperative for the Winteraceae to stand alone; it is without close allies. Similarly, the Illiciaceae and Schisandraceae must make up a discrete unit at some level, not interrupted by other families. And the close relationship of the Magnoliaceae, Himantandraceae, and Degeneriaceae is too well established for discussion.

The true position of several remarkable, morphologically isolated, and now exhaustively studied generic "relicts"—*Trochodendron, Tetracentron, Cercidiphyllum*, and *Euptelea*—has been questioned in recent years. So distinct are these genera from others of the general ranalian affinity that they can justifiably be placed in the order Hamamelidales as well as in the "woody Ranales" (by whatever ordinal name). But to place them as Hutchinson does is surely to ignore a voluminous literature, without providing the slightest refutation. We find *Trochodendron* in its own family in the Magnoliales, *Cercidiphyllum* and *Euptelea* combined in that order into the family Cercidiphyllaceae (surely strange partners), and *Tetracentron* quite lonesome in the order Hamamelidales. This latter order, which practically all other phylogenists believe to be a close derivative from a primitive ranalian stock, Hutchinson places well along in his scheme. We shall not find *Tetracentron* until volume 2 is published, and there it will be separated from its very close ally *Trochodendron* by many large and differently related orders.

But such are the perils that face an author who tries to establish the impossible—a linear sequence of concepts that cannot be linearly arranged.

Despite these and other evidences of undocumented predilection, Hutchinson is presenting a work of such magnitude that no other botanist has ever attempted it single-handed. His long and profound experience gives him every right to express a minority opinion, and, perhaps in some controversial alliances, future research may prove that his opinion is the most logical. Taxonomic surveys of so comprehensive a nature appear no more often than two or three per century, and then they are usually produced by a team, or indeed by a whole "school" of botanists. We are fortunate that so experienced a phylogenist as Hutchinson has had the courage to begin the monumental survey he now projects.

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Coastal Change Processes

The Coastline of England and Wales. J. A. Steers. Cambridge University Press, New York, ed. 2, 1964. xxx + 750 pp. Illus. $18.50.

Steers has updated his original treatise by nearly doubling the number of chapters, adding nearly five pages and many references to an index originally 24 pages long, and writing 172 new pages of text. In order to keep the volume within reasonable size and cost limits, however, the 117 photographs of the earlier edition (1946, reprinted with slight corrections in 1948) were sacrificed, together with a valuable index map that supplied locality names useful to readers who do not have an intimate knowledge of English coastal geography. Throughout the new text, in bold type, are references to plates published in Steers's *The Coast of England and Wales in Pictures* (Cambridge University Press, 1960). Forty-eight new figures bring the total to 162.

The first 547 pages of text duplicate exactly those of the original book. In reality eight of the new chapters are appendices that present useful discussions of studies as recent as 1963, in methodical order, counterclockwise from Solway Firth to Berwick, on the North Sea. Five new chapters cover classification of coasts (all classifications are regarded as having their strong and weak points and none is easy to apply to Britain); wave action and beach formation (C. A. M. King's recent conclusions are regarded as sufficient); movement of beach material (the longest, more than 12 pages, discusses investigations by C. Kidson and A. Carr, investigations at the Hydraulics Research Station, Steers's more recent work on Scolt Head Island, and similar studies); geodetic leveling and vertical movements of the coast (the shortest, less than two pages, suggests a contemporary rise of sea level of between 3 and 12 centimeters per century, but cautions against acceptance of results of precise leveling); and, earth embankments (a subject that needs research because ideal stabilizing plants are not known).

Students of sea coasts are deeply indebted to Steers for his many penetrating studies carried out over the years, and for his critical evaluations of the works of others, on the coast of England and Wales. By combining physical, biological, archeological, and