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

historical evidence, he has given us not only detailed knowledge of the scenes of his own extensive field investigations but also insight as to directions that necessarily must be followed by investigators elsewhere. Although his studies have been systematic and inductive, they are a valuable guide to anyone interested in the processes of coastal change and deductions as to their consequences. It may be predicted that few scholarly reports on coastal investigations will appear without pertinent references to this valuable volume. A comprehensive bibliography would have strengthened the volume.

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Physics

The Propagation of Electromagnetic Waves in Plasmas. V. L. Ginzburg. Translated from the Russian edition (Moscow, 1960) by J. B. Sykes and R. J. Tayler. Pergamon, London; Addison-Wesley, Reading, Mass., 1964. xx + 535 pp. Illus. $14.75.

This is the second English translation of Ginzburg's Russian textbook, published in Moscow in 1960, that has been made available to American readers. The book is divided into eight sections. An introductory chapter precedes four chapters that are concerned with developing the theory of waves in unbounded equilibrium plasmas of increasing complexity: homogeneous isotropic, homogeneous anisotropic, inhomogeneous isotropic, and inhomogeneous anisotropic. The next two chapters apply this theory to the ionosphere and to solar and interstellar propagation of radio waves, and the last chapter presents an introduction to nonlinear phenomena.

The first translation, published in 1961, was greeted warmly because it filled such a conspicuous gap in our bound literature. Nevertheless, a number of serious shortcomings greatly impaired the book's usefulness. Those who are not familiar with the first translation may be interested in two reviews of it—*American Scientist* **50**, 325a (September 1962) and *Physics Today* **15**, 70 (October 1962).

The new translation has capably dealt with practically all of the faults of the previous one. The first translation was frequently awkward and sometimes grammatically incorrect as well as technically misleading—for example, the use of "strongly homogeneous electric field" when *strong, homogeneous electric field* was intended. It is obvious that the translators of the present volume were both bilingual and technically competent. The print of the new volume is of the highest quality, whereas in the first translation it was difficult to distinguish boldface (vectors) from lightface type, and to read small subscripts and superscripts. Another difficulty encountered in using the first translation, particularly as a reference source, was the lack of an index. The table of contents was brief, and somewhat cryptic, and therefore not too helpful unless one had a detailed knowledge of the book. This new translation has a reasonably complete index; the main fault that remains uncorrected is that names are not indexed (with the exception of certain classic names—for example, Debye and Cherenkov).

That the first translation was more of a transliteration than a translation was also indicated by the bibliography. The Western reader was given references to Russian literature, but there was no indication of whether English translations were available or where they might be available. This has been corrected by providing complete bilingual references. In addition, where no English translation is available, a supplementary reference may be given —for example, a reference to the Russian I. E. Tamm's *Fundamentals of the Theory of Electricity* also refers to the translation of Landau and Lifshitz's *Electrodynamics of Continuous Media.* The bibliography has been enlarged by some 200 references, principally covering the literature through 1962, and making up for the previous paucity of Western references. Unfortunately, these were added in proof and are not referred to in the text. Thus, approximately half of the 536 entries in the bibliography are of limited use. On the other hand, a considerable cross-pollination of work is available because the references are about equally divided between Russian work and Western work. The author notes in his preface to this English edition that in *Radio Waves in the Ionosphere*, by K. G. Budden, only one among some 250 references cites Russian work. We might note, however, that such American books as *Electromagnetic Waves in Stratified Media*, by J. R. Wait, and *Waves in Anisotropic Plasmas*, by Allis, Buchsbaum, and Bers, do indeed maintain a broad international scope with respect to their derived material.

The author has added three appendices in which he deals superbly and completely with fundamental theorems relating to propagation and energy in dispersive media. Aside from rather superficial treatment in most of our standard graduate textbooks, the only reasonably complete discussions previously available have been in Landau and Lifshitz and in the excellent but difficult Allis, Buchsbaum, and Bers.

It is well to understand that this is a treatise concerned with fundamentals of wave propagation, albeit in a sophisticated approach. It does not consider bounded media or nonequilibrium plasmas. Thus, beams and beam-interactions are not treated. Effects of a finite temperature are developed, but in a relatively elementary way. These limitations undoubtedly reflect Ginzburg's primary interest in ionospheric physics and certainly do not detract from the book's excellence within its scope.

The proofreading on this volume must have been painstaking, for I noted astonishingly few errors. And not only is this translation superior in every respect to the first translation, but its price is only $14.75, contrasted with $38 for the first translation. This new translation definitely deserves a place on the plasma physicist's bookshelf.

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Applied Mathematics

A Course of Mathematical Analysis. vol. 2. A. F. Bermant. Translated from the Russian edition (Moscow, 1959) by Ian N. Sneddon. Pergamon, London; Macmillan, New York, 1963. xii + 374 pp. Illus. $9.

It might be mentioned at the beginning of this review that the number of pages (374) is not a true indication of the book's actual content because large parts of it appear in small print. This book, the second of a two-volume work (the first volume covers the requisite work on the theory of functions of one variable), consists of the following chapters—"Functions of several variables, differential calculus"; "Applications of the differential calculus"; "Multiple integrals and iterated integra-