This is the third edition, and some 200 pages have been added. According to the implication on the dust jacket, this revision has taken cognizance of advances in science, although admittedly the articles are for the general reader and not, as stated for example, the nuclear physicist who certainly knows more about his own field than an article in such a work as this can possibly tell him. Fair enough; what then of the nuclear physicist who may consult this volume with respect to matters outside his field—for example, material published in *Science?*

He will find rather good coverage on all sorts of plants, usually to family name and specific identity. Evidently someone with some knowledge of botany supervised these entries. However, he will not find an entry for *Neurospora* or for mould, although there is an excellent entry for penicillin. The editors have not caught up with gibberelin or gibberelic acid. Zoological entries are on the whole much less satisfactory than botanical ones; seldom is the name given for the family or the species of an animal (except for such familiars as cat, dog, and horse), and often there are errors. Prawns do not differ from shrimps in the possession of a rostrum; the bluefin tuna is not "also called the horse or jack mackerel"; barnacles are not classified among the "larger crustaceans," and the crab illustrated on page 1039 is not *Callinectes sapidus.*

Zoological information seems to have been downgraded to a certain extent in this edition. Under skunk, for example, generic names have been omitted (although the matter of omitting formal family names in zoology but including them in botany is a trait of both the second and the third edition), whereas skunk cabbage, which is cross referenced to arum, yields names of major species of Araceae. In short, this encyclopedia will irritate a zoologist, but it will probably be acceptable to a botanist. The entries under evolution and genetics (sans *Neurospora!*) are well done.

The plates, which were gathered together at the end of the second edition, are scattered through this edition so that they could be placed near the appropriate entries. By virtue of this reshuffling, ecology has become a major entry because two pages of illustrations formerly labeled "Animals, terrestrial life zones" are now labeled "Ecology"; the short article that appears under this name, however, will not please most ecologists.

The chief utility of an encyclopedia such as this is to supply just enough information to meet casual curiosity and immediate need for clarification or amplification, and beyond that to guide the reader to further information. In the first uses this work serves well for the scientist seeking such information outside his field. Some of the references, however, seem oddly chosen, and quite often reference is made to the "study by Doe, 1954" without further explanation. Such references may be difficult to locate and accurately identify.

In summary, although *The Columbia Encyclopedia* can be recommended to scientists for general nonscientific matters, it sometimes falls short for clergymen and politicians (one wonders if a physicist would be satisfied with the entry for laser) who may be reading a copy of *Science.* It is not very enlightening, for example, to be informed that the contributions of Josiah Willard Gibbs "have had a profound effect on industry, notably in the production of ammonia." Nevertheless, the general usefulness of this encyclopedia greatly offsets its comparatively minor shortcomings, which will perhaps be taken care of in subsequent editions. Encyclopedia editors obviously have as much difficulty keeping up with science as the rest of us, and on the whole this encyclopedia's editors have done well.

JOEL W. HEDGPETH
Pacific Marine Station,
Dillon Beach, California

Surface Science

Recent Progress in Surface Science. vol. 1. J. F. Danielli, K. A. G. Pankhurst, and A. C. Riddiford. Academic Press, New York, 1964. xii + 414 pp. Illus. $16.

This is one of the many recently published collective volumes, perhaps even a typical one, for it has three noncontributing editors and 14 authors who have contributed 11 chapters (four authors are responsible for the shortest of the chapters). The need for collective effort in an authoritative presentation is made obvious by considering the scope of this volume, which ranges from the theory of the double layer (Haydon) to the description of cell contacts in tissues as studied by electron microscopy (Mercer), and from the behavior of soap films (Kitchener) to the surface of semiconductors (Tannenbaum-Handelman), and includes, among others, chapters on surface viscosity (Jolly), electrode processes (Schuldinger), and facilitated diffusion (Stein). Perhaps a collective book review is also indicated, because any single reviewer is likely to be introduced to some new subjects while he is preparing his "critical judgement."

It is certainly true that our information explosion has aggravated the fragmentation of this information so that, as is well stated in the preface, work of importance to one or more branches of surface science "is locked up in journals designed to cater for the specific needs of another branch. Coupled with this is the tendency for workers in a branch to use their own terms for concepts which are, or may become, common. . . ." Thus, there is a real need for collective volumes "of critical reviews of the different disciplines," through which specialists working in one area can try to communicate with those working in different areas. Such reviews must be very different, however, from reviews and especially from research reports designed for fellow specialists in the same discipline. It would seem to be the responsibility of the editors to insist that, at least in this respect, a collective volume must be reasonably homogeneous, with clear definitions of any little known concepts, in order to accomplish its stated purpose. In volume 1 of *Recent Progress in Surface Science* some articles do accomplish their purpose splendidly. Those on semiconductors, corrosion, and facilitated diffusion are particularly informative. The one on foams and films should also be very illuminating for many readers although, as a "fellow specialist," I could argue some minor points. Some of the other chapters tend to deviate to lesser or greater extent from this objective, but they often compensate for their deviation by the completeness of their treatment and the richness of their references. A minor but irritating example of the type of deviation to which I refer is the repeated use (in chapter 10) of "PAS positive" without any explanation of its meaning.

The unique scope of this book, and

its generally authoritative treatment, will make it indispensable as an introduction to the literature and as a guide to the many interesting facets and applications of surface science for many years. We can hope, however, that the editors will use their authority to make the next volumes even more valuable to "other specialists."

KAROL J. MYSELS
Department of Chemistry,
University of Southern California

Biogeography Theory

The Geography of the Flowering Plants. Ronald Good. Wiley, New York, ed. 3, 1964. xvi + 518 pp. Illus. $13.

The publication of this third edition of a well-known discussion of biogeographical theory—Good's *The Geography of the Flowering Plants*—will be welcomed by botanists, and particularly by taxonomists and others concerned with evolutionary problems. The new edition invites comparison with its forerunners published in 1947 and 1953. At the outset one may congratulate the author for keeping abreast of his subject, for one of the strengths of the new edition is its excellent bibliography, which lists 838 titles in contrast to 295 in the first edition and 629 in the second edition.

A comparison of the three editions shows that there is only one completely new chapter in the current volume; in many other respects the scope of the changes is somewhat disappointing. For instance, the same 25 halftone plates are used in all editions, and they do not always bear much relationship to the associated text. However, several important new text figures and maps have been added, and others have been refined in accord with current opinion. The new edition follows the same logical sequence in developing (in part 1) the facts of angiosperm distribution, insofar as the author's firsthand experience and study permits, and (in part 2) the factors of distribution, including the author's explanation of the facts.

Examples are truly worldwide in scope and are admirably presented but, because chapter 12, "The floras of the southern hemisphere," is new, it is worthy of particular attention. In summarizing his own recent and scholarly work and his extensive field studies in Australasia, Good shows a full appreciation of the great importance of southern floras in providing clues to a solution of the central problem: how did the flowering plants attain their modern distributional patterns? The author has now become greatly impressed by the significance of New Guinea, which is indeed critical in the opinion of many biogeographers. In discussing the Australian flora, he points out that it comprises three very different components: (i) a true Australian flora, which is very large and has relationships, as much as any exist, that are suggestive of South Africa; (ii) a small "Antarctic" element, related to the floras of temperate South America and New Zealand; and (iii) a small extension of the great Indo-Malayan flora. Stress is laid on the differences between the "great and peculiar Australian flora proper" and that of New Guinea, only 100 miles away.

Good sees no explanation of this except that these areas were not always in their present locations. Without suggesting a positive solution, he implies that the Wegener-Du Toit concept of continental drift, which has linked Australia and New Guinea historically, might be modified to a quite different concept that would have these land masses brought to their present proximity by a gradual diminution of the distance between them in the course of geological time. How this new scheme would account for the Indo-Malayan element (which, incidentally, includes some of the most primitive angiosperms) in eastern Australia is not explained by Good.

Part 2 of the book is not basically changed from that of the second edition, except for the welcome inclusion of certain new materials derived from recent studies, many of which bear on geophysics. Chapter 21 indicates that Good is still thoroughly convinced that the only possible explanation of angiosperm distribution is found in theories of continental displacement. In view of the continuing disagreements among geophysicists with respect to the reality of such major displacement, or at least in view of their skepticism about any such large-scale movement in Cretaceous or later time, it is perhaps dangerous for a mere biologist to fix so avidly on continental drift as the only explanation of angiosperm distribution.

Since the author himself is so emphatic, one may quote certain statements (p. 407) that are unchanged since the second edition: " . . . it can be said, in the writer's opinion, without fear of rebuttal, that the theory of continental drift explains the peculiarities and leading features of Angiosperm distribution more simply than any other hypothesis." And then " . . . drift can explain the details and sequence of distribution in a way quite beyond the power of any reasonable theory of land-bridges or of the theory of distribution entirely by dispersal. The writer also believes that few will read the early chapters of this book dispassionately without coming to the same conclusion."

Good is doomed to disappointment in his expectations: he should have a real fear of rebuttal (many such are available in print); and indeed a great many dispassionate students of the "facts" will come (and have come) to a quite different conclusion. The particular chapter being quoted (chapter 21) appears to be highly subjective; it slights the massive biological evidence favoring other conclusions. Discussion of land-bridge theories is comparatively cursory and unsympathetic, even somewhat distorted, and evidences of long-range dispersal are lightly dismissed. To refute Good's conclusions would require a treatise as extensive as his and obviously cannot be lightly undertaken. Any writer on so controversial a subject may be inclined to favor evidence that furthers his preconceived concepts (however soundly these may be based on accurate observation), ignoring or neglecting other evidence that tends to contradict, or indeed to refute, some of his basic ideas of the factors of distribution.

Although my comments stress disagreements among botanists with respect to the "how" of modern angiosperm distribution, I wish to reiterate my admiration for one of the outstanding biogeographers of our time. He is entitled to discuss a controversial subject in a controversial manner. His revised major work is a "must" for every student of phytogeography and indeed for every student of biogeography. If a fourth edition should be forthcoming, one might hope that Good's often quoted "Theory of Tolerance" will be extended in a different way to those who interpret the "facts," and especially the facts related to southern floras, in a different manner.

A. C. SMITH
University of Hawaii, Honolulu