istic of 20th-century science—the increasing pace of research, the growth of multiple authorship, the support of foundations, the classified status of much research, the rapid diffusion of knowledge and application of discoveries, and the increasing role of nuclear science. The growing interdependence of the different branches of chemistry and even of different sciences that was one of the outstanding characteristics of the first half of the 20th century is admirably illustrated. Not only the better-known classics of the period are included but also many lesser-known works worthy of note. Inasmuch as Leicester "hoped that these selections will be of value in years to come to the general historian of chemistry or, more widely, of science," he avoided selections that are almost entirely mathematical, such as the original papers of Debye and Hückel or Heitler and London. Instead, he wisely chose later works of these authors which "explain the ideas behind the mathematical symbolism." This attractive, readable volume will not only interest the historian of chemistry but will also be a valuable supplement for today's texts, most of which unfortunately have little space available for the historical dimension of chemistry.

The second collection, *Classical Scientific Papers—Chemistry*, is an oversized, luxurious volume containing 31 facsimile reproductions of famous scientific papers by 24 authors on the development of 19th-century chemistry, specifically on theories of matter. It chronicles, through the words of the participants in the controversy, the vicissitudes undergone by the atomic theory in the course of its development from John Dalton's initial statement of 1808 to Jean Perrin's demonstration of the existence of molecules by his 1910 interpretation of the Brownian motion.

The general reader may be surprised at the extent to which leading chemists of the 19th century expressed doubt not only as to the existence of atoms but also as to the elementary nature of the elements. Reading these polemical papers will give him a deeper appreciation and understanding of the nature of scientific progress, which in this book is portrayed not as a spiral ascending steadily upward but as a series of ups and downs with more than one cul-de-sac—for example, Sir Benjamin Brodie's Chemical Calculus. Among the authors of the selections, which include not only journal articles but also lectures, excerpts from books, and one encyclopedia article, are such "greats" of chemistry as Dalton, Thomson, Wollaston, Berzelius, Davy, Liebig, Faraday, Dumas, Graham, Kekulé, Williamson, and Ostwald, as well as some lesser luminaries. This is not just another anthology of discontinuous selections. The papers are intimately linked, and several of them are discussions or criticisms of other papers in the collection. Thus a continuous story with drama and excitement emerges.

A few admittedly minor but annoying shortcomings mar this otherwise handsome volume. Although the authors, titles, and complete references for each selection are cited in the table of contents, this information is not repeated at the heads of the individual papers, and the result is ambiguity in several cases. In many cases additional, unrelated material has been included in the facsimile reproductions; but more seriously, though in a lesser number of cases, pertinent material such as footnotes (for example, on pp. 83, 319, and 332) has been inadvertently omitted.

A new edition of an old favorite, *Discovery of the Elements*, for the sixth edition of which Mary Elvira Weeks received the 1967 Dexter Award, can paradoxically enough be reviewed in one paragraph, not because of its unimportance but because its value is well established and recognized by all. This reviewer can do little to add to the praise which other reviewers have accorded to earlier editions. This definitive and unique work originated from a series of articles in the *Journal of Chemical Education* and thus suffered from episodic and irregular organization. In this latest edition, Henry M. Leicester has corrected this shortcoming by rearranging the material and reducing the number of chapters from 31 to 21. In so doing, he has made the work a true book, in spirit as well as in format. Virtually every page bears signs of his revision; he has missed no opportunity to update this standard work even in the smallest of details. Although he has added new material, he has succeeded in reducing the number of pages from 910 to 896, a feat that other revisers might do well to emulate. A veritable treasury of documentation and citation from original sources, the book contains a fantastic number of references (2688), and its 373 well-chosen illustrations add to its utility.

GEORGE B. KAUFFMAN
Department of Chemistry,
California State College, Fresno

Mesophase for Biologists

Liquid Crystals. Proceedings of an international conference, Kent, Ohio, Aug. 1965. Coordinated by GLENN H. BROWN, G. J. DIENES, and M. M. LABES. Gordon and Breach, New York, 1967. viii + 486 pp., illus. $30.

The 29 papers in this volume have been republished unchanged from five numbers of the journal *Molecular Crystals* for 1966 and 1967. The reason for collecting and reissuing these papers, which were originally presented in 1965, would seem to be that of reaching a wider audience than the regular readers of *Molecular Crystals*. Certainly a large part of this potential audience is biological. Biologists have often been fascinated by what might be called the "meso-phenomena"—such as mesomorphism and semiconductivity—of physics, sensing in them a relevance to biological phenomena which is, perhaps, intense in proportion to the inscrutability of the latter. There are indications that the role of the liquid crystalline state in biology—once described as chaotic—is becoming narrower but more secure. Biologists are no longer excited by the mesomorphic behavior of viruses in water or polypeptides in dioxane. Muscle has outgrown its mesomorphism for at least the reason that a classification is not an explanation. Finean has deleted the description of the myelin sheath as a liquid crystalline structure from the second edition of *Biological Ultrastructure,* perhaps to signify that not all ordered noncrystalline materials are liquid crystals.

But whether membranes should be called mesomorphic is secondary to the considerable convergence of the physical chemistry of lyotropic mesophases and membrane biophysics, to which the Mueller-Rudin-Tien bilayers bear witness. Although the Luzzati phase transitions are currently overshadowed by the transport-mediating antibiotics and the membrane proteins remain a mystery of ever-growing importance, the relevance of the lyotropic mesophase as a macrohomologue continues to be impressive.

Liquid crystals, then, have their place in biology, and so does *Liquid Crystals.* Not meant to supplant Gray's monograph on thermotropic systems or to provide a complementary treatment of lyotropic systems, the book presupposes some familiarity with the mesophase and the techniques for studying it. Nevertheless, most of the contributors

have taken pains to provide background information, and the papers are as much short reviews as specialized technical reports. The contributions are well balanced between thermotropic and lyotropic systems, and the close relationship which has come to be recognized between the two is made clear. The trend of much of the work is away from the complex bulk optical properties of liquid crystals and toward their molecular properties, and this trend will help considerably in winning a wider audience.

This volume is belated, and it is regrettable that the editors chose not to compensate by going outside the conference proceedings to shore up some weak spots. Most of the biology included is weak or peripheral, and contributions from a membrane biophysicist and biochemist would have filled a gap made conspicuous by the thrust of the physical studies.

The book is outrageously overpriced at $30. The publishers have foredoomed a volume which otherwise merits attention.

I. R. FENICHEL
Laboratory of Cellular Biophysics, Albert Einstein Medical Center, Philadelphia, Pennsylvania

Soviet Geomorphology

Processes of Coastal Development. V. P. ZENKOVICH. J. A. Steers and Cuchlaine A. M. King, Eds. Translated from the Russian edition (Moscow, 1962) by D. G. Fry. Interscience (Wiley), New York, 1967. xvi + 738 pp., illus. $37.50.

There is no doubt that this book is an outstanding work, probably one of the most significant contributions since D. W. Johnson's classic *Shore Processes and Shoreline Development*. Zenkovich's book covers a wider range of topics and employs a larger amount of hydrodynamic interpretation. Major emphasis is placed on two subjects of traditional interest: equilibrium beach profiles (chapters 2 through 5) and variation of beach forms alongshore (chapters 6 through 9). The last six chapters deal with such topics as coastal development as affected by vertical movement, proximity to rivers, aeolian processes, and tides and storm surges. A concise account of shallow-water hydraulics appears in the first chapter.

The author states that "the main ideas developed by Soviet scientists are described in some detail in this book." Thus, of the 1105 references, as many as two-thirds are Soviet contributions. Although this feature is a bonus to Western scientists, the reader will be annoyed by the author's fond comparison between Soviet and non-Soviet contributions, in which the former are usually favored. Not only is such comparison unnecessary, but it is also meaningless, since the proportion of quoted references hardly represents the true proportion of contributions. For instance, Zenkovich implies that most non-Soviet authors reject the null-point concept altogether and that very few are in some measure of agreement with Cornaglia. As a matter of fact, an exhaustive study regarding this concept was conducted by non-Soviet workers, among them Ippen, Eagleson, and their colleagues at M.I.T., during the 1950's. This study, though widely known and quoted in the Western world, is not mentioned in the book. Apparently, the author is a victim of a circumstance which he himself deplores: inadequate exchange of information between Soviet and non-Soviet scientists.

The book is essentially concerned with coastal morphology, and, understandably, the treatment is qualitative. It would have captured a wider circle of readers had it been more generous with topics relating to dynamics. The book describes a theory by Shulyak which is said to make it "possible to predict the size of ripple marks at a given depth and for a given material from the parameters of the surface waves." According to this theory, "currents over a ripple-marked sea bed may move as much as three times faster than over an even bed," thus increasing the sand transport greatly "even when the undisturbed speed is below the threshold velocity for sand of the size involved." Information as important as this should have been accompanied by quantitative evidence. This shortcoming is found in the treatment of several other topics, including that of littoral currents. A theory by Shadrin, the first of its kind to consider the effects of surface gradient and bottom irregularities on the velocity distribution in the surf zone, should have been discussed in more detail.

The book reveals some interesting aspects of the Soviet school of coastal morphology. One such aspect is the concept of equilibrium beach profile, in which the role of initial bottom slope is emphasized. It is suggested that at a certain critical angle of slope a zone of deposition will occur away from shore and "will finally appear above the surface of the water as a narrow strip known as a barrier island beach." The possibility that a bar can emerge above water surface on a gentle slope was demonstrated years ago by a wave-tank experiment at the University of Tokyo's Coastal Engineering Laboratory. Another interesting aspect is the wide recognition among Soviet scientists of rhythmically curved shorelines and bars as well as sand waves on the shallow sea bed. These features are migratory in the direction of sediment movement and probably represent a certain mechanism linking processes of sediment movement with those of beach topography. They have received little attention in this country, although they do develop along many parts of our coasts.

The book is recommended for a graduate-level reading course in physical geography as well as for libraries of geography, geology, and coastal engineering.

CHOULE J. SONU
Coastal Studies Institute, Louisiana State University, Baton Rouge

Disease in Plants

Physiological Plant Pathology. R. K. S. WOOD. Blackwell Scientific Publications, Oxford, 1967 (distributed in the U.S. by Davis, Philadelphia). xiv + 570 pp., illus. $11.50. Botanical Monographs, No. 11.

Despite their intrinsic importance as biological phenomena, the physiological and biochemical mechanisms underlying the induction and development of plant diseases have not received detailed attention. For nearly a century, the discipline of plant pathology has been concerned chiefly with the ecology (in a broad sense) and genetics of pathogens and their hosts and with the scientific principles of disease control through chemicals, plant breeding, and cultural practices. There is a growing awareness, however, that many of the current disease-control practices may be limited by complexities in the biological balance existing between potential pathogens and their hosts and, in addition, that the needs and demands of agriculture and society are changing. As a prelude to different and less empirical control procedures, there has been a decided shift in research emphasis towards the basic physiology and biochemistry of host-parasite interactions.