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.

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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.

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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.

The information in Wood's book is organized from the view of pathology and follows a familiar pattern: description of entry and penetration of pathogens, enzymes of cell wall penetration and degradation, toxins in pathogenesis, growth distortions, mechanisms of wilting, and, finally, consideration of factors involved in resistance. In a sense, the title *Physiological Plant Pathology* is misleading, for most of the book deals with fungal diseases, and the large subdivision of plant pathology dealing with viral diseases is ignored entirely. This is at least partially understandable, in view of the specialized techniques and terminology of virology; yet comparative examination of lesion formation, growth distortion, or resistance and susceptibility in viral, bacterial, and fungal diseases might have served to illuminate one of the basic questions of plant pathology, the nature of host responses to infection. Study of viral disease offers the advantage of avoiding the complication of a second organism contributing to the observed physiological and metabolic responses as disease progresses.

Within its framework, the book does provide a balanced account of some fundamental problems. It will be of value to the pathologist not directly working with host-parasite physiology and to senior and graduate students, the audience to whom the work is addressed. In controversial areas, the author conscientiously details the conclusions of the relevant papers and gives recognition to many of earlier contributions which established the behavioral basis for subsequent physiological studies.

The physiologist, biochemist, or pathologist actively engaged in the field may be less comfortable with this approach. Accustomed to examining a variety of biological events according to groups of common reaction mechanisms, these readers may find it inconvenient, for example, that some important physiological properties of toxins are discussed much later than in the chapter on toxins. Similarly, the role of hormones in plant disease is treated under several headings, although in appropriate contexts. One result of such treatment is that historical perspective on physiologic advances is absent. In the discussion of wilting mechanisms, the two key experimental papers which are responsible for many of the current views on wilting are not introduced until after most of the supporting research to which they gave rise has been described. The organization of the book obscures a prime goal of physiologic and biochemical research; that is, to discover general mechanisms that will explain a number of apparently unrelated observations. In a traditional presentation such as that in this volume the significance of original research important for a number of diseases is underplayed and hindsight appears to be rewarded. The elegant work of Japanese groups on metabolic alteration in diseased sweet potato is treated cursorily while later work on other diseases, far less satisfactory in approach and execution, is explored more fully. Yet the Japanese work provides a highly desirable experimental model for all diseases.

Although the extended presentation of opposing views serves a function, on occasion it obscures the real problems and gives a misleading view of the current status of research. Five pages of text are devoted to various definitions of *vivotoxins,* a term many workers now feel has little operational value, although as a cautionary concept it may have some limited use. Even so, it is difficult to decide at the end of the five pages which of the concepts is accepted for purposes of exposition, and one finds in subsequent pages that no specific concept has really been exploited. Similar comments can be made about the treatment of other topics, such as uncoupling toxins, phytoalexins, and oxidative enzymes.

By choosing to provide a comprehensive survey of existing opinion, Wood has advertently or inadvertently highlighted the lack of agreement by research workers on many crucial questions. The discussion of resistance mechanisms surveys the well-known ways, both morphological and biochemical, in which resistance can be operative. Philosophically, it is not difficult to adopt the concepts; the difficulty lies in obtaining the experimental facts to support a precise mechanism in a specific disease. It is disheartening to note the qualifications that are attached to many of the claims in the literature.

The dearth of agreement on fundamental mechanisms is due in part to the diversity of biological material which has come under investigation. Any endeavor to formulate valid general physiological principles is handicapped by the fact that many of the data available in the literature represent single-shot, isolated pieces of individual research, often only incidental and not independently verified products of investigation of a single host-parasite combination of economic importance. The knowledgeable reader of Wood's book will understand, sympathetically, that an equivocal stance on certain topics results as much from the state of the science as from the philosophy of the author. It is disappointing, however, that a large portion of the résumé of conflicting opinions appears to be based on the published conclusions of individual workers, rather than on critical evaluation of the original papers. Much of the uncertainty in the field has its roots in methodology through obvious differences in the handling of biological materials and in the application of the physical and chemical procedures. Progress will occur only when critical evaluation of procedures is endemic and key concepts are tested by more rigorous experiments than have been reported to date. Wood has provided us with a useful point of departure for research efforts, since he has indicated where current knowledge is less than satisfactory and has provided a sound description of a wide variety of the biological events that must be explored further.

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