crown gall tumor inception is reviewed by R. E. Beardsley, who introduces a refreshing quantitative approach to the conceptualization of the problem. F. Meins provides further evidence for the instability of the tumor state, including its potential for reversibility, and H. N. Wood addresses himself to the factors underlying the growth autonomy of crown gall cells; of particular interest is the fact that the cell division factor elaborated by tumor cells appears to be a potent phosphodiesterase inhibitor and therefore may induce in the cancer cell elevated levels of cyclic adenosine monophosphate.

This book should be of interest to a much broader range of scientists than those specializing in oncology. For example, biologists should know something about the natural history of the genetic tumors, or the fact that the wound tumor virus is a double-stranded RNA virus capable of multiplying in both plant and animal cells. Or that on the one hand this virus may pass into the eggs of virus-bearing female leafhoppers, while on the other may entirely lose its capacity to infect insect cells if grown solely in plant tissue for a period of five to ten years. There are many other nuggets of information in this valuable book.

This is not to say that there are no shortcomings. The two authors who address themselves to this reviewer's work do so in a superficial and totally misleading way. Similarly, in the paper on genetic tumors, Näf's work is covered in two sentences (p. 143) beginning with "Näf (1958) proposed that species involved in tumorous combinations may be divided into 2 subgroups . . . ," which conveys to the reader neither the massive evidence that supports Näf's proposition, nor the fact that this was the most important conceptual breakthrough since Kostoff discovered the *Nicotiana* hybrid tumors in the first place. In the review of the early work on crown gall (p. 3) one gains the impression that it was White who was primarily responsible for demonstrating that crown gall tissue was truly autonomous—not a mere bacterial hyperplasia—whereas that conclusion had already been reached by Braun in his early work on secondary tumors. These kinds of errors probably reflect the inadequate state of communication among the plant cancer workers —whose work, after all, is not published in a few specialized journals but is instead spread all through the biomedical literature. Nor are there enough conferences to permit a profound exchange of concepts and information.

The rather backward state of the field reflects, in part at least, the ignorance and snobbism displayed by many if not most of our animal, and particularly medical, colleagues. As the editor of the series, F. Hamburger, points out in the foreword, "There remain numerous problems in clinical medicine that no amount of clinical study can solve." The last paper in this volume, by Braun, addresses itself to the relevance of plant tumor systems to the phenomenon of cancer and should be read by all oncologists to gain greater insight into such phenomena as the cellular autonomy that underlies the cancer state, and particularly into the mass of evidence, both plant and animal, that the cancer state does not involve an irreversible alteration in the genetic make-up of the cell.

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Developmental Processes

Hormones in Development. Papers from a conference, Nottingham, England, Sept. 1968. MAX HAMBURGH and E. J. W. BARRINGTON, Eds. Appleton-Century-Crofts, New York, 1971. xx, 854 pp., illus. $30.

The 65 individual papers in this volume come from laboratories throughout the world and deal with a wide range of hormones in diverse systems. The volume should not be considered an all-inclusive exposition of the current status of experimentation on hormone effects on development. First, the coverage is spotty. Twenty-six of the papers deal with effects of thyroxine, largely on amphibian development and nervous system development. There are notable contributions from the Levi-Montalcini group on nerve growth factor and from Cohen on epidermal growth factor. Other hormones covered in some detail are parahormone and calcitonin, and various effects of steroid hormones on the development of the sex organs are dealt with. The second major limitation of the volume relates to the delay in publication of some three years. During that time considerable advances have been made in understanding the mechanisms of action of various hormones, including the mediation of cyclic adenosine monophosphate in the action of various of the peptide hormones and epinephrine, the pervasiveness of the existence of cytoplasmic and nuclear protein receptors for steroid hormones, and emerging studies utilizing DNA-RNA and DNA-DNA hybridization techniques, and the isolation of specific messenger RNA's to study the synthesis and utilization of various specific nucleic acids as affected by hormones during development.

Although *Hormones in Development* has certain drawbacks and should not be a primary source for beginners who wish to obtain an overview of current research in the field, it does contain some valuable information that should be useful to those students and investigators who wish, from one volume, to determine the state of the art as of 1968–69. Of particular value are those papers dealing with effects of thyroxine on amphibian development and early brain development. They represent a fine series of basic observations on thyroxine effects in these two systems. Such observations can now, one hopes, be transcribed into a more basic understanding of the molecular basis of the effects of hormones in developing systems.

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A Microenvironment

Ecology of Leaf Surface Micro-organisms. Proceedings of a symposium, Newcastle upon Tyne, England, Sept. 1970. T. F. PREECE and C. H. DICKINSON, Eds. Academic Press, New York, 1971. xviii, 640 pp., illus. $26.

Preece and Dickinson have edited a very significant book that deals with the relationship of microorganisms and their environment. In this case the environment is the outer skin—the phylloplane—of leaves, and the microorganisms are the numerous bacteria, yeasts, and fungi that are residents on leaf and bud surfaces.

The book includes the text of 47 papers presented at a symposium and transcripts of discussions. The papers are grouped into five sections. They include descriptions of new experimental methods and results as well as reviews of prior work.

The first section deals with the local environment and concerns the characteristics of leaf surfaces. The anatomy

and the chemical and physical characteristics of leaf surfaces and cuticular membranes are described, with the aid of very good electron micrographs of leaf surfaces. Then leaching from plants, modification by pollution, and microclimate of leaf surfaces are discussed.

Nine papers on saprophytes that are found on leaf surfaces constitute the second section. They describe methods used to estimate the number of microorganisms and the varied populations of bacteria, yeasts, and fungi that reside on leaves and buds of some agricultural plants.

Pathogens on leaf surfaces are the subject of the third and largest section, comprising 16 papers. The dispersal and trapping of spores by leaves, the microenvironment and the chemical environment in relation to growth of fungi, and interactions of bacteria are discussed. The only paper on viruses reviews data that ectodesmata are involved in infection sites of tobacco mosaic virus. Three papers concern development, sporulation, and structural changes in mildew infections. This section includes many electron micrographs and vivid descriptions of the infection process and the changes that accompany it. Only one chapter concerns control of leaf pathogens.

Six papers in the fourth section deal with senescing leaves. One considers biochemical aspects, the others the microbiology of leaves as they senesce, fall, and decompose.

The last and perhaps the most significant section is devoted to interactions on the leaf surface. It includes papers on the effects of leaf exudates on fungicides and on appressorium formation, photoalexins and restriction of fungal growth, and antagonism between pathogenic and saprophytic microorganisms. An interesting paper on the grass sheath as a site for nitrogen fixation describes the widespread occurrence of nitrogen-fixing bacteria on leaf surfaces and how they act as a "factory" for the production of organic nitrogen.

This book emphasizes that leaves are more than just a site for photosynthesis. They provide a surface on which many microorganisms reside, and the interactions of these microorganisms with each other and with the leaf have an important bearing upon the growth of the plant. Research workers and students in plant pathology, microbiology, botany, agriculture, and general biology will find much of interest in these papers. The editors are to be commended in bringing together 64 experts from five continents and in so well organizing their papers into this excellent book with author, systematic, and subject indexes.

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Physiological Adaptations

Responses of Plants to Environmental Stresses. J. LEVITT. Academic Press, New York, 1972. xiv, 698 pp., illus. $32.50. Physiological Ecology.

To write a book on frost resistance or water stress in plants would be a sizable undertaking in its own right, but to combine both these and other environmental stresses into a single volume represents a mammoth effort which very few lone authors would be willing or qualified to undertake. It is clear not only from the preface but from the content of this book that the author has tackled this task in order to present an integrated view of the physiological and chemical mechanisms by which plants avoid, adapt to, and respond to the environmental stresses water deficit, temperature extremes, and high salt concentrations, as well as radiation. Pollution, which is featured on the dust jacket, is however only a minor consideration. The responses dealt with are by and large the extremes of stress that may cause injury or death, and this is not an attempt to cover all aspects of temperature response or the water relations of plants. The exclusion of nutrient deficiencies, except where they interact with the other stresses, is not only understandable but a wise decision for the sake of clarity. The central thread, or recurrent theme, in this presentation is the importance of sulfur bonding and sulfhydryl groups in regulating the response of proteins and membrane structure to stress. The literature coverage is excellent, with close to 2000 references, and it must be said that although there is often a bias in favor of the "SH hypothesis," which may in fact be quite justified, other explanations of stress response are fully documented and discussed to give a balanced presentation. However, the further the author digresses from his own specialty, that is, the molecular basis of stress responses, the less critical become his views on the data presented. One aspect that comes through rather clearly is the continuing search for meaningful tests that can be used in predicting the tolerance of plants to frost, water, and salt stresses, and this underlines our as yet incomplete understanding of the nature of stress and stress responses.

The material is well presented in short, clearly headed sections, which do however result in some repetition. Students, and I suspect many others, would be well advised to read carefully the definitions in the two opening chapters in order to master such terms as "direct elastic dehydration strain," "poikilotherm," and "homoiohydric." More than half the book is concerned with temperature stresses, with the next largest section that on water stress. Radiation and salt stresses, each with about 40 pages, have a much smaller but still significant coverage. Each subject is presented in an orderly fashion, under headings that deal with the nature of the stress, avoidance, tolerance, and so on, with comments on the possible mechanisms of injury and resistance. Although the experts may argue on points of interpretation, the excellent literature coverage of this volume makes it invaluable as a reference for both students and those undertaking research in the field of environmental stress.

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Books Received

Advances in Creep Design. The A. E. Johnson Memorial Volume. A. I. Smith and A. M. Nicolson, Eds. Halsted (Wiley), New York, 1972. xx, 486 pp., illus. $42.50.

Advances in Experimental Social Psychology. Vol. 6. Leonard Berkowitz, Ed. Academic Press, New York, 1972. xiv, 310 pp., illus. $12.50.

Advances in Heterocyclic Chemistry. Vol. 14. A. R. Katritzky and A. J. Boulton, Eds. Academic Press, New York, 1972. x, 408 pp., illus. $27.50.

Africa and the Islands. R. J. Harrison Church, John I. Clarke, P. J. H. Clarke, and H. J. R. Henderson. Wiley, New York, ed. 3, 1972. xviii, 542 pp., illus. Paper, $22.50.

Air Sampling Instruments. For Evaluation of Atmospheric Contaminants. American Conference of Governmental Industrial Hygienists, Cincinnati, ed. 4, 1972. Variously paged, illus. $12.50.