to the international or Passamaquoddy project first proposed by Dexter P. Cooper in 1919. A second paper by the same author reviews the economics of tidal power including the possibility of combining tidal power production with a pumped-storage scheme.

The objective of the paper entitled "Mathematical model of tidal regimes in the Bay of Fundy" is to provide a quantitative evaluation of the effects of several power schemes on tidal ranges throughout the bay. The paper is largely a qualitative description of a two-dimensional tidal model which includes Coriolis effects. None of the governing equations are given and there are no references to the details of this model or to any previous mathematical models for tidal motion in the Bay of Fundy.

Several papers are concerned with other potential tidal power sites: an experimental station on the White Sea near Murmansk in the U.S.S.R., Cook Inlet in Alaska, and San José Gulf in Argentina. A number of short papers discuss engineering aspects of hypothetical tidal power schemes, turbine design, and corrosion properties of ferrous and nonferrous metals and concrete.

A well-documented, one-dimensional tidal model for the Bristol Channel is given. The objective is to calculate the head difference across a proposed barrage in this estuary. Another British contribution is a mathematical model for predicting the effect of tidal barriers on sedimentation in estuaries. The last paper discusses some of the environmental aspects of tidal power production.

DONALD HARLEMAN
Department of Civil Engineering, Massachusetts Institute of Technology, Cambridge

Water

Water and Aqueous Solutions. Structure, Thermodynamics, and Transport Processes. R. A. HORNE, Ed. Wiley-Interscience, New York, 1972. x, 838 pp., illus. $37.50.

Few of the properties of liquid water and aqueous solutions have been satisfactorily explained at the molecular level. There are two major reasons for this. First, liquids are more complicated than solids with their periodicity and gases with their randomness. The radial distribution function of water reveals that it possesses some structure, but details of this structure and how it fills space are unknown. Second, hydrogen bonding is not well understood; but it dominates the properties of water and its solutions. In view of these difficulties, what might be expected from this book?

There are 19 chapters, most of which are reviews of various topics more or less related to the book's title. The choice of topics is puzzling. Three chapters are devoted to ice but none to solid hydrates or aqueous clathrates. Four chapters are devoted to liquid water, including a whole chapter on its viscosity. There are no chapters on the quantum chemistry of water or on water vapor. Ten chapters are devoted to aqueous solutions. The inclusion of chapters on seawater and biological fluids, to remind the reader that these are aqueous electrolyte solutions, was unnecessary. The chapters devoted to nonaqueous electrolyte solutions and fused salts are inappropriate for the book.

There are two excellent chapters. Ben-Naim and Stillinger's chapter on a statistical mechanical theory of water is a prelude to the molecular dynamics study of liquid water by Rahman and Stillinger (*J. Chem. Phys.* **55**, 3336 [1971]). In the molecular dynamics study, the motion of 216 rigid water molecules under the influence of a carefully chosen intermolecular potential was simulated in a computer. The positions and orientations of the molecules were recorded as a function of time; thus, transport and thermodynamic properties could be calculated for the set of molecules and observations could be made on structure in the set. What is observed with molecular dynamics depends on several things, including the intermolecular potential. In their chapter, Ben-Naim and Stillinger discuss the choice of a suitable potential function, the properties of the function used by Rahman and Stillinger, and how such a function might be used to study water with the methods of statistical mechanics that have been used to study simpler fluids. In another chapter, on dilute aqueous solutions of nonpolar solutes, Ben-Naim examines the statistical mechanics of such solutions, scrutinizes the thermodynamics of mixture models used to explain the anomalous behavior of water toward these solutes, and suggests some new approaches to understanding this anomalous behavior which is central to the concept of hydrophobic interactions.

The chapters by Ben-Naim and Stillinger, in which the authors present ideas on how to move beyond present clichés used in the study of aqueous systems, are the most interesting of the book. Argument over whether liquid water is a continuum or a mixture and use of nebulous terms like "structure-making" and "structure-breaking" to describe solutes in water are unlikely to lead to any advances in our understanding of water and its solutions. Unfortunately much of this book, like much of the work reported on aqueous systems, is couched in such terminology. There is little in the book to satisfy any expectations.

W. J. SCANLON
Department of Chemistry, University of California, Los Angeles

Cancer Models

Plant Tumor Research. A. C. BRAUN, Ed. Karger, Basel, 1972 (U.S. distributor, Phiebig, White Plains, N.Y.). x, 236 pp., illus. $17.40. Progress in Experimental Tumor Research.

It is an axiom of research that one should pick simple systems to work out models for the solutions of complex problems. Almost every field of biology related to cancer research can trace its origin, or much of its early development, to work done on plants: The tobacco mosaic disease was among the first shown to have a viral etiology, and this virus was the first to have its chemical identity established. Hooke was looking at plant material when he coined the term "cell"; Mendel worked out the basic laws of genetics on the garden pea; Sumner crystallized the first enzyme from beans; and Braun showed almost two decades ago that the cancer state is reversible in tobacco plants. It is ironic that work on plant cancer is conducted by only a handful of investigators around the world, who have difficulty attracting either young recruits or grant support.

The new volume *Plant Tumor Research*, edited by the dean of plant cancer research, Armin C. Braun, is therefore a most welcome addition to the series Progress in Experimental Tumor Research. This volume devotes most of its space to the crown gall system, but there are in addition two excellent reviews on genetic tumors and on the wound tumor virus system, written by the senior investigators in these two areas, H. H. Smith and L. M. Black. The problematical topic of

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.

TOM STONIER
Laboratory of Plant Morphogenesis, Manhattan College, Bronx, New York

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.

ROBERT T. SCHIMKE
Department of Pharmacology, Stanford University School of Medicine, Stanford, California

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