discussion of "algebraic numbers" should open vistas. Haag's exposition of the relationship between points on a line and real numbers should clarify a "take-for-granted" set of concepts.

All in all, this is a well-constructed, well-written book. It has ample sets of problems, the problems being nontrivial, nonstandard, and integrated into the flow of textual material. It is unusually free of errors, typographical and otherwise. My criticisms are minor: the statement that essentially there is only one model of a complete ordered field is delayed almost to the point of missed impact; the 1-1 relationship between points on a line and real numbers is stated, "to every point there corresponds a unique real number" is proved, but the status of the converse of this last theorem does not seem to be covered.

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Chemical Technology

The Properties of Glass Surfaces. L. Holland. Wiley, New York, 1964. xvi + 546 pp. Illus. $15.

Because scientists working in different fields use glassware, in a variety of shapes and at different temperatures, in contact with gases and liquids, there is a need for reliable information about the surface properties of glasses. Much work has been done on this subject, but the data are scattered, frequently in journals not readily available. Thus, Holland's book will be welcomed by chemists, physicists, and engineers.

The author's many years in research concerned with the deposition of films on glasses in high vacuums has given him wide experience in the field. Experimentation with high vacuums requires a thorough understanding of the properties of glass surfaces, of the methods of cleaning glass, and of the phenomena of adhesion and friction. One of the major difficulties is that glass surfaces are not defined by the composition of a glass but depend strongly on the way they are obtained. Polishing an optical glass changes its chemical and physical properties, and the phenomena that occur during this process are not yet fully understood. A short discussion of the composition and the structure of glasses precedes the author's excellent description of the methods used in polishing optical glasses and the different chemical and physical methods used in cleaning the surface of a glass. He also discusses the various sources of contamination.

The physical properties of glass surfaces are divided into chapters on optical, electrical, and mechanical properties involving friction of glasses in contact with liquids and metals. Among the chemical properties of glass surfaces, corrosion phenomena are of greatest importance to those who use glass. The chemical interaction between glass surfaces and gases and vapors is discussed from several points of view. Those who use glass for vacuum equipment will find much valuable information on the sorption and desorption of gases, especially water vapor, on the diffusion of helium through different glasses, and on the effects of electrical discharges on these interactions.

Surface chemistry encompasses several processes that improve the surface properties of glass or make the surface an electrical conductor. The wetting properties of glasses by different liquids and the adhesion of metals and organic polymers are thoroughly discussed. In all cases the author has balanced practical and theoretical aspects so well that his book is most stimulating to anyone interested in the behavior of surfaces.

The reader can easily follow the progress made in this field and obtain a good picture of the present status of theory. Workers in the field of glass will welcome the numerous well-chosen references that enable one to follow up details.

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Research Résumé

Osmotic and Ionic Regulation in Animals. W. T. W. Potts and Gwyneth Parry. Pergamon, London; Macmillan, New York, 1964. xiv + 423 pp. Illus. $9.

This is the first monograph devoted to the broad subject of osmotic and ionic regulation in animals since Krogh's book in 1939. Potts and Parry review this rapidly advancing field from the viewpoint of general biology. The first chapter is an excellent summary of the physical principles necessary for understanding the mechanisms of osmotic and ionic balance. This chapter will be particularly useful to students of zoology who lack background in physical chemistry and cellular physiology. Chapter 2 deals with excretory organs in general and includes some useful new figures of the excretory systems of various animals. Unfortunately, there is little mention of the extensive information afforded by electron microscopy, particularly of Malpighian tubules, flame cells, and vertebrate kidney, and no mention of Bodil Schmidt-Nielsen's useful correlations of ultrastructure with the direction of active transport.

Then follow chapters in which the authors survey osmotic and ionic conformity and regulation in animals from marine, brackish, and freshwater environments. After initial statements of the problems associated with each habitat, specific animal groups are discussed. However, the physical principles developed in the first chapter are scarcely used in these three important chapters. For example, the numerous papers on *Necturus* kidney tubules (by Solomon, Whittenbury, and others) are not much discussed, and much new information on the cellular mechanisms of frog-skin and toad-bladder potentials is omitted. Evidence for volume regulation in supunculids (Gross) is omitted in favor of the older idea of lack of such regulation (Adolph).

Chapters 6 and 7 consist of very good surveys of regulation in terrestrial animals and in hypo-osmotic regulators. In few areas of the subject has there been so much change with respect to basic concepts as in mammalian renal physiology, and zoologists will find here a clear and concise discussion of these advances. Cellular mechanisms are described, particularly concerning ionic fluxes, and some of the unanswered questions are presented. One fails to find any new explanation of the meaning of hypo-osmotic regulation in certain marine crustaceans.

The final two chapters deal with the relation between respiration and electrolyte metabolism and with control of electrolyte balance. The interesting facts are that the total oxygen consumption of many osmoregulators increases in dilute media but isolated tissues often show reverse effects, and that the increase in organismic respiration is too great to be due to the regulating tissues alone but some regulators fail to show the increase. No explanations of these paradoxical observations are available.