are ancient in Australia (Keast), and some extant groups clearly (ratites, megapodes) or probably (parrots) so; about other groups of birds the evidence of time or direction of arrival in Australia is inconclusive.

The origins and ecology of aboriginal humans are treated in part 7 (147 pp.). Aboriginal occupation of Australia certainly began more than 35,000 years ago (A. G. Thorne), probably much earlier. It seems to have been associated with the extinction of large marsupials and birds, as well as of other animals. Fire clearly became more important in the Australian environment after the arrival of humans (N. B. Tindale). Recent studies of the cultural anthropology of the aborigines, which have provided a rich array of new insights into their hunter-gatherer economy, are reviewed.

This is a landmark volume of the greatest importance in understanding the natural world of the island continent, Australia. It will long repay careful study and will doubtless help to stimulate whole new cycles of investigation of the fields with which it deals.

PETER H. RAVEN
Missouri Botanical Garden, St. Louis 63166

Medical Institutions

The Invention of the Modern Hospital. Boston, 1870–1930. MORRIS J. VOGEL. University of Chicago Press, Chicago, 1980. x, 172 pp. $15.50.

Today the general hospital forms the center of America's medical system. Patients expect to go to the hospital when they are ill; physicians insist that modern medicine can be practiced best in these central institutions where laboratories and expensive equipment are located. The visibility of the hospital today, however, should not blind us to the fact that the hospital's position at the pivot of medicine is a relatively new phenomenon. Traditionally physicians practiced in the homes of patients, and only the poor and solitary sought treatment among strangers in hospitals. Morris Vogel's concise analysis of the evolution of the modern hospital in Boston between 1870 and 1930 places the hospital in its rightful historical perspective and provides insight into how and why the institution took its modern form. Vogel rejects an analysis of hospital growth based solely on the advancing techniques and capabilities of medical science. Instead, he emphasizes the social and economic factors that transformed charity hospitals into modern scientific institutions that serve all classes of people.

In 1873, when Vogel's study begins, a survey of the United States identified only 120 hospitals; by the 1920's there were more than 6000. The typical patients in the early hospitals were people with limited resources. The medical procedures these patients received could have been administered at home, were it not that their rooms were unheated or dirty or crowded and they had no one at home to care for them. The physicians who attended these charity institutions, in marked contrast to their patients, formed the medical elite of Boston, socially well-positioned people who sought hospital appointments to develop their skills and reputations and who expected no remuneration for their services. A diverse set of factors gradually made this model of hospitalization obsolete. Vogel analyzes in turn the political influences in a city with a large immigrant population, the impact of new medical and surgical procedures, the developing professionalization and specialization of physicians, the effects of urbanization and industrialization on the family's ability to care for its sick, the clinical needs of medical education, the costs of the new medicine, and the tensions between private nonhospital physicians and their hospital-based colleagues. Vogel argues that the modern hospital developed out of identifiable needs and desires of physicians, lay hospital boards, patients, and public officials. His research is based squarely on hospital records, medical society papers, newspapers, private archives, and interviews.

Vogel's most important contribution is his analysis of middle-class motivations and patterns for moving to the hospital. Unable to make the transition directly into hospitals they regarded as repositories of the socially marginal, yet feeling increasingly unable to take care of sick friends and relatives in cramped urban apartments or alone in lodgings, middle-class urban dwellers first found refuge and medical attention in new private hospitals that appeared at the end of the 19th century. Initially little more than boarding houses for the sick, these institutions catered to the affluent and eased their transition ultimately to the better-equipped general hospital. The book's weakest aspect is its assumption that the new hospital medicine necessitated a view of patients as mere physiological entities. Vogel ignores the humanizing influences of medical social work, which flourished in the new hospitals, and unjustifiably credits traditional medicine with more concern for the whole patient than it frequently exhibited.

Although Vogel concentrates on Boston in his analysis of the evolving American hospital, he is aware, with Oliver Wendell Holmes, whom he quotes, that "to write of 'Medicine in Boston' is not unlike writing of the tides in Boston Harbor. Boston is a fraction of the civilized world, as its harbor is part of the ocean." Vogel's book is the best available historical account of the development of modern hospitals in America. It is also a good reminder that some institutions we take for granted today developed only in the recent past and may in time themselves give way to new forms.

JUDITH WALZER LEAVITT
Department of the History of Medicine, University of Wisconsin, Madison 53706

Biochemistry

Biology of Carbohydrates. Vol. 1. VICTOR GINSBURG and PHILLIPS ROBBINS, Eds. Wiley-Interscience, New York, 1981. 320 pp., illus. $49.50.

Though carbohydrates have been studied extensively for several decades, significant progress has been made in recent years, and thus the series this volume initiates is timely.

In chapter 1, Vincent C. Hascall, whose work over the past decade or so has dramatically clarified the complex organization of proteins, proteoglycans, and glycosaminoglycans in connective tissues, discusses the development of his research as well as the work of others in the field. His chapter provides a clear and concise picture of the current understanding of the biochemistry of mucopolysaccharides and includes sufficient information concerning the experiments to enable the reader to follow the strategy and the development of conclusions. The emphasis is on carbohydrate-containing macromolecules and proteins in cartilage, although those in other connective tissues are also discussed. As Hascall points out, this field has now reached the stage at which important questions concerning the function of connective tissue polymers can be addressed.

In the second chapter, Enrico Cabib and Eleanor M. Shematek discuss the structures of cell wall polysaccharides of selected species of yeast, fungi, and plants as well as the general organization of polymers in the cell matrices. The biosynthetic pathways for several of the

structural polysaccharides, particularly yeast mannan, fungal chitin and glucan, and plant cellulose, are treated in detail. The subcellular localization of the batteries of glycosyl transferases that participate in the assembly of the complex polymers, the localization and direction of their growth, and the role of the cellular fibrillar networks in their assembly are discussed. Finally, a model of structural differentiation and development in which specific polysaccharide hydrolases play a role in the modulation of cell structure is presented. The model is based on precise genetic regulation of the processes involved, and progress in its development will depend upon achieving a better understanding of them at the genetic level.

Remarkable progress in the elucidation of bacterial cell wall structure has been achieved in the past two decades. In chapter 3, Robert S. Munson and Luis Glaser review this progress and present a detailed account of the current understanding of the subject. Coverage of the mode of biosynthesis of cell wall polymers is extensive and is complemented by a description of the events leading to the assembly of the teichoic acids, peptidoglycan, proteins, and lipids in the multilayered, three-dimensional structure of the cell wall.

The membrane of the human erythrocyte, like those of other eukaryotic cells, contains a variety of intrinsic and extrinsic glycoproteins. The major sialoglycoprotein, glycophorin A, has been studied extensively and has been proposed as a model intrinsic membrane glycoprotein. In chapter 4, Heinz Furthmayr outlines the experimental approaches to the determination of the complete structure of glycophorin A, its amino acid sequence, the positions and structures of the many carbohydrate side chains, and the structure and function of the three major domains of the protein that relate to the external amino-terminal, the glycosylated portion, the hydrophobic intramembrane portion, and the carboxy-terminal portion that occupies the internal face of the erythrocyte membrane. The author discusses the evidence supporting the possible functions of glycophorin as a cell surface receptor and as a structural element of the membrane and its role in determining the antigenic mosaic of the erythrocyte surface.

In chapter 5, Jack Preiss and Donal A. Walsh provide a detailed, up-to-date review of the structure and metabolism of glycogen and starch in bacteria, plants, and animals. The treatment focuses on the regulation of the enzymes and enzyme systems that participate in the biosynthesis and breakdown of these polysaccharides. It is truly an exercise in comparative biochemistry to compare the complex hormonal regulation of glycogen metabolism in animals with the equally complex regulation of starch and glycogen metabolism in plants and microorganisms.

Overall, this volume is an excellent beginning for the series. Both the topics and the contributors are well chosen, and the chapters are clear and well documented.

EDWARD C. HEATH
Department of Biochemistry, University of Iowa College of Medicine, Iowa City 52242

The Role of Diet in Cancer

Nutrition and Cancer. Etiology and Treatment. GUY R. NEWELL and NEIL M. ELLISON, Eds. Raven, New York, 1981. xiv, 446 pp., illus. $49.50. Progress in Cancer Research and Therapy, vol. 17.

It is now just over 60 years since it was clearly demonstrated that cancer could be produced experimentally in animals. This discovery came at a time when there was a growing realization that some diseases are due to deficiencies of trace dietary components, and it was natural in such circumstances that there should be considerable interest in the role of nutrition in the development of cancer. Experiments over the next 30 to 40 years showed that carcinogenesis could indeed be influenced by factors such as caloric intake and level of fat in the diet, but interest in the subject gradually lessened, in part because the studies of nutrition and cancer in animals had no clearly perceived relevance to human cancer.

Meanwhile, epidemiological data were being collected that showed large geographical differences in the incidence of and mortality from particular types of cancer. Other evidence, particularly from studies of migrating populations, indicated that these differences were largely due to environmental rather than hereditary influences. Comparison of the data with the results of animal experimentation showed that some of the dietary components that influenced the susceptibility of animals to cancer were correlated with mortality from the same types of cancer in humans. These observations have led to a revival of interest in the role of nutrition in cancer and have stimulated many experimental and epidemiological studies in recent years. Along with the renewed interest in nutrition as a factor in the causation of cancer has come an increased awareness that nutrition plays an important role in the treatment of cancer patients. Literature on the subject has burgeoned, and numerous symposiums have been devoted to it.

The present volume is an ambitious attempt to cover the various aspects of the role of nutrition in both the causation and the treatment of cancer. On the whole, the contributors have succeeded in providing a good overview of the current state of knowledge.

The book includes chapters on the epidemiology of cancer and on the associations between cancer and such dietary constituents as fat, fiber, vitamins, minerals and trace elements, artificial sweeteners, food additives and contaminants, and alcohol. The availability of in vitro assays has made it easier to detect the presence in food of mutagens, some of which are produced by exposure to high temperatures during cooking. Such substances are potentially able to act as carcinogens as well. Diet can also have an important influence at the promotional stage of carcinogenesis, and dietary components such as fat probably act as promoters rather than as carcinogens. Other chapters are devoted to nutrition, immunology, and cancer and to the relationship of diet to hormones and cancer.

In assessing the impact of diet on cancer it is desirable to be able to quantify dietary intake, and a section of the book deals with methods of nutritional assessment. Dietary intakes estimated from diet histories or diaries are subject to many inaccuracies and methods involving direct weighing and analysis of food consumed are tedious and time-consuming. Some indication of nutritional status and body composition can be obtained from anthropomorphic measurements such as height, weight, skinfold thickness, and body circumference, but such methods also have limitations. Although many biochemical tests have been used for nutritional assessment, there is no single ideal marker for early malnutrition. Newer noninvasive techniques such as computerized axial tomography can be used to provide information on specific organs of normal and cancer patients. However, it is clear that more and better methods of nutritional assessment are greatly needed.

The last section of the book is devoted to the role of nutrition in the treatment of cancer patients. A well-nourished patient generally has a more favorable prognosis, and providing optimal nutrition is a major challenge for the medical