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ABSTRACTS of Review Articles and Educational Materials in Physiology

FOREWORD

This is the second annual collection of abstracts of educational material presented by the Educational Materials Review Board of the American Physiological Society under the direction of the Education Committee. Board members have submitted abstracts of review articles, texts, books, manuals, learning programs, and audiovisual material which they have found valuable in teaching physiology. Selection of items is wholly at the discretion of members and where more than one member chooses to abstract the same material, each abstract is presented. We hope you continue to find this collection useful in teaching physiology and appreciate your suggestions and interest.

Orr E. Reynolds
Editor

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CELL PHYSIOLOGY

- 1 BIOCHEMICAL ANALYSIS OF MEMBRANES, edited by A.H. Maddy, John Wiley & Sons, Inc., New York, pp. 513, 1976

By intent, this book is a methods book. It describes how to isolate membranes from several systems. It then describes how to analyze the protein, carbohydrates and lipid components of isolated membranes. Isolates come from mycoplasma, simple cell plasma membranes, mitochondria, endoplasmic reticulum, and nuclei.

The style of writing is very good. Authors use simple sentences and are quite explicit. Each author has organized his material so carefully that the reader follows the exposition easily. Bibliographic citations are not exhaustive and were not meant to be. Probably, the authors chose those methods to cite which were most useful for their own work. Understandably, all are not perfect. The chapter on mitochondria by G.L. Sottocasa is poorly written. This reviewer was irritated with the inappropriate use of plurals for Latin-derived nouns and their spelling and the misplacement of adverbs. More to the point, it is hardly a critical article and rather redundant. In contrast, chapters by the editor, A.H. Maddy, are models of conciseness. His chapters on the solubilization of membranes and techniques for the analysis of membrane proteins were excellent because they were well-organized expositions of the problem and cited the best references. His Table 6.1 which summarizes protocol procedures for solubilization of membrane proteins must be a labor of love because of the scholarship involved in its compilation.

Harold G. Hempling

- 2 DYNAMIC ASPECTS OF CELLS. (Book 3, Basic Biology Course, Unit 1 - Microscopy and Its Application to Biology.) Tribe, M.A., I. Tallan, M.R. Eraut, and R.K. Snook. Cambridge University Press, New York and London, 119 pp., 1976.

This book is written primarily for undergraduates who are taking a course in cell biology for the first time. Each concept presented is followed by a series of questions with answers. The format is such that the student answers a question and compares this answer with the one in the book. A wrong answer is corrected by the student retracing the previous steps. The book is a programmed course of study and presents (1) locomotion and contact inhibition, (2) mitosis, (3) the cell cycle, (4) fertilization, and (5) meiosis and its genetic consequences. These activities are covered in accompanying film strips of live cells including tissue culture cells. Appendices present classroom experiments on determining the human karyotype, tetrad analysis with fungi, and genetics and chromosome squashes with the fruit fly. A well-carried out aim of the book is to dispel any idea that cells are inert and static. The Basic Biology Course uses the self-teaching and audio-tutorial methods of instruction, and this book is best used in conjunction with other books in this Course.

D.E. Buetow

- 3 ELECTRON MICROSCOPY AND CELL STRUCTURE. (Book 2, Basic Biology Course, Unit 1 - Microscopy and Its Application to Biology.) Tribe, M.A., M.R. Eraut, and R.K. Snook. Cambridge University Press, New York and London, 117 pp., 1975.

This book is written primarily for undergraduates who are learning the fine structure of plant and animal cells for the first time or who, having been exposed to this subject briefly before, wish a better understanding of it. The excellent electron micrographs presented are each followed by a series of questions with answers. The format is such that the student answers a question and compares this answer with the one in the book. A wrong answer is corrected by the student retracing the previous steps. The book is a programmed course of study and presents (1) the essential structural features of the electron microscope and an explanation of their function, (2) the main methods of preparing specimens for electron microscopy and the likely side-effects of these methods, (3) the ways to recognize the main cell organelles and to determine the three-dimensional structure of these organelles from electron micrographs, (4) the methods of estimating the relative sizes of cells and their organelles, and (5) some techniques for isolating cell organelles. Some parts of the book are supplemented by slides and an explanatory tape. The book is best used in conjunction with other books in the Basic Biology Course, but is coherent in itself and could be used alone.

D.E. Buetow

CIRCULATION

- 4 BLOOD-BRAIN BARRIER IN PHYSIOLOGY AND MEDICINE. Rapoport, S. I. Raven Press, New York, 1976, 316 pp.

This monograph provides extensive coverage of the following subject areas: (1) a general introduction to structure of, and transport in, cells and tissues; (2) sites and functions of the blood brain barrier; (3) permeability and osmotic properties of the blood-brain barrier; (4) pathological alterations of the blood-brain barrier; (5) control of drug entry into the central nervous system; (6) transport of sugars, amino acids and other substances across the blood-brain barrier and (7) structure and function of blood-aqueous and blood-vitreous barriers of the eye. Each chapter begins with a well-written precis and the following detailed analysis is easy to read. The monograph brings together, for the first time, all the important concepts of blood-brain barrier dynamics and demonstrates how these basic tenets can be utilized to solve specific clinical problems. Advanced medical students, graduate students and physiology teachers will find the book to be unusually stimulating and informative.

Harris J. Granger

- 5 BLOOD-BRAIN BARRIER IN PHYSIOLOGY AND MEDICINE. Stanley I. Rapoport. Raven Press, New York, 1976.

The central nervous system is separated from the remainder of the body by the Blood-Brain Barrier, and this has important consequences in the metabolism and function of the brain. This monograph presents a very concise survey of current concepts about the barrier. The first two chapters give a review of the structure and function in cells and tissues, and this provides a framework for the remainder of the book. Chapters are devoted to the sites and function of the barrier, barrier permeability, pathology, and the transport of metabolites across the barrier. The final chapter concludes with a discussion of barriers in the eye. The book provides an excellent integrated approach to the special problems of the fluid compartments in the brain, and Rapoport has provided a clear analysis of the emerging concepts in this area of neurophysiology. Every attempt has been made to relate the basic physiology to clinical problems, and so the book should be valuable to research and clinical scientists alike.

Ernest M. Wright

- 6 CARDIOVASCULAR PHYSIOLOGY II. MTP INTERNATIONAL REVIEW OF PHYSIOLOGY VOL 9. Guyton, A. C., and Cowley, A. W. (eds.). University Park Press, Baltimore, 1976, 393 pp.

This volume consists of 9 reviews spanning the entire range of cardiovascular science. Schmid-Schonbein presents an in-depth analysis of hemorheology with special emphasis on microcirculatory phenomena. Haddy et. al. review the basic concepts of transcapillary fluid balance and utilize this framework to elucidate the effects of naturally occurring vasoactive agents, exercise, ischemia and shock on fluid transfer. Mancina et. al. analyze the cardiopulmonary receptors and reflexes; in a closely related review, Gauer and Henry focus on the role of cardiac stretch receptors in neurohormonal control of plasma volume. Langer et. al. provide a concise and well-integrated analysis of the ultra structural, biochemical and mechanical bases of myocardial contraction. Bishop et. al. review the factors influencing cardiac performance with special emphasis on intrinsic and neural mechanisms. Two reviews are devoted to cardiac dysfunction, specifically congenital heart disease and myocardial infarction. In the final chapter, Guyton et. al. present a broad outline of overall cardiovascular control. As a whole, the volume represents a rich source of information for teachers of medical and graduate cardiovascular physiology.

Harris J. Granger

- 8 THE FICK PRINCIPLE. Pamela Horton (1976). Department of Physiology. St. Mary's Hospital, Medical School. London. This package contains an audiotape and a work book. There is also a printed text of the tape. Following the instructions on the audio tape the learner works through the book. The process begins simply and becomes progressively more difficult as the concepts and data become more complex. The learner who works through the book completely should have a good working knowledge of the Fick principle. A complete work through should take an hour or two for a completely naive student, but less if there is prior knowledge of the field. Learners may work in groups. Working through the package was pleasant and fun of a sort. Some of the dangers and assumptions are not described.

Wendell N. Stainsby

- 10 HEART SIZE, Lincoln E. Ford. Circulation Research 39: 297-303, 1976.

This brief review summarizes how the growth of heart muscle in the normal heart occurs in such a way as to maintain a constant relationship between pressure, and the ratio of wall thickness to ventricular radius. One of the difficult problems in cardiac physiology has been the difficulty relating the numerous studies of mechanics in isolated heart muscle to similar studies in the intact heart. This review helps to bridge this gap in describing how the performance of isolated heart muscle would translate to similar performance in the intact heart. In particular, data is reviewed which suggests that there is a special relationship between the peak systolic pressure developed by the left ventricle and the ratio between wall thickness and ventricular radius. This is another way of stating that the Laplace relationship helps to determine the quantitative inter-relationship of these variables. It is further proposed that this relationship might be used as an indication of myocardial disease since it would be upset if there was a marked decrease in contractility in a given heart. This article is particularly valuable for graduate students and faculty members who must deal with this conceptual jump from isolated heart muscle to the intact heart in a teaching situation.

W.W. Parmley

- 7 CIRCULATORY ADJUSTMENTS TO DYNAMIC EXERCISE AND EFFECT OF PHYSICAL TRAINING IN NORMAL SUBJECTS AND IN PATIENTS WITH CORONARY ARTERY DISEASE. Clausen, J.P. Progress in Cardiovascular Diseases 38(6): 459-495, 1976.

This review provides a good survey of recent work with extensive referencing. The emphasis is upon the distribution of blood flow to different organs and how this is affected by exercise and by physical conditioning. The review covers circulatory adjustments in normal subjects and in patients with coronary artery disease; effects of physical conditioning on normal subjects and patients are reviewed. Based on recent experiments, some interesting hypotheses are offered about the mechanisms of circulatory adaptation. The work contributes to the understanding of overall circulatory regulation in man and constitutes a valuable source for medical students, graduate students and teachers of physiology.

L.B. Rowell

- 9 GENETICS OF HUMAN HAEMOGLOBINS. A. Lang and P. A. Lorkin. British Medical Bulletin, Vol. 32 No. 3, September (1976), pp. 239-245.

The authors point out that today there are known more than 250 abnormal hemoglobins. These "mutants" form the base of the current ideas about the genetics of human hemoglobin. This paper will be of value to physiology teachers, to geneticists and to students of physiology and dynamic biology. The authors address themselves to adult hemoglobins, fetal and embryonic hemoglobins, chromosomal arrangements of the globin-chain genes, regulatory processes controlling globin gene expression, and various other aspects of the molecular genetics of hemoglobin (e.g. point mutations, sporadic new mutations, crossing over effects). A well selected list of references is included in this well organized, clearly written, effectively illustrated paper.

CHARLES G. WILBER

- 11 HYPOXIA ON THE PULMONARY CIRCULATION. HOW AND WHERE IT ACTS. Fishman, A.P. Circ. Res. 38:221-231, 1976.

Pulmonary hypertension which results during acute and chronic hypoxia is a distinct physiological phenomenon with obvious medical implications. This article reviews potential mechanisms that could be responsible for the pulmonary vasoconstriction. It briefly summarizes the evidence for autonomic nervous involvement in the process. Most of the review is spent considering evidence on intrinsic pulmonary mechanisms. Chemical mediators, direct effects of hypoxia, metabolic and electrical-mechanical coupling are all considered for their role in bringing about increased vasomotor responses. Likely sites of pulmonary vasoconstriction are also discussed. This excellent review will be of value to respiratory and cardiovascular physiologists at both the student and faculty level.

H.M. Frankel

- 12 INTEGRATED MECHANISMS OF CARDIOVASCULAR RESPONSE AND CONTROL DURING EXERCISE IN THE NORMAL HUMAN. Smith, E. E. Guyton, A. C., Manning, R. D. and White, R. J. *Progress in Cardiovascular Diseases* 18:421-443, 1976.

In the last few years, several extensive reviews of cardiovascular dynamics in exercise have appeared. Due to the complexity of the subject matter, few attempts have been made to provide a concise, yet conceptually complete, overview of circulatory responses to exercise. The 22 page review by Smith et. al. accomplishes this aim and thereby provides medical and graduate students with a tightly woven summary of the field. The topics covered include: (1) local and neurogenic control of vascular tone in regional vasculatures; (2) control of cardiac output via modulation of heart rate and stroke volume; (3) regulation of body heat; (4) trans-capillary fluid shifts and (5) role of muscle afferents in modulating arterial pressure. The contribution of each factor to the 4 phases of exercise and their interactions in overall cardiovascular homeostasis are examined.

Harris J. Granger

- 14 MICROCIRCULATION VOL. 1. Kaley, G., and Altura, B. M., (eds.) University Park Press, Baltimore, 1977, 444 pp.

This multi-author work is the first in a series of 3 volumes devoted to microcirculatory phenomena. The 19 review chapters are organized into 6 main topics: (1) structure of the microvasculature; (2) biology of endothelium and connective tissue; (3) blood-tissue exchanges; (4) biophysical aspects of microcirculation including rheology and microvessel mechanics; (5) angiogenesis and (6) lymph and lymphatics. Students and teachers searching for an overall appraisal of the field of microcirculation will find this book to be a valuable resource.

Harris J. Granger

- 16 NEUROHUMORAL CONTROL OF PLASMA VOLUME. Gauer, O.H., and J.P. Henry. In: *MIP International Review of Science: Cardiovascular Physiology*, II, Vol. 9, pp. 145-190. Butterworth, London, 1976.

This review updates three earlier reviews by these authors (1956, 1963, and 1970) while it restates the main lines of evidence which indicate that blood volume is an independent variable that is sensed and regulated by receptors within the low pressure sections of the cardiopulmonary region. The coverage of the literature is good. The following subjects are reviewed: (1) mechanism of controlling the filling pressure of the heart via reflexes from stretch receptors in the cardiopulmonary region; (2) the effective compliance of the circulation; (3) nature, location, etc. of the receptors and details of the volume control reflex; (4) whole body water immersion as an illustration of interaction between thoracic volumes, pressures, and water clearance plus sodium excretion; (5) neurohumoral mechanisms of volume control - role of various stresses and maneuvers on secretion of antidiuretic hormone and renin-aldosterone; (6) integration of volume and osmocontrol; and (7) volume regulation in various pathophysiological conditions. The overview is comprehensive and the authors have succeeded in pulling together many complex interactions in volume control in man and other species. Perspective would be improved if the reader also read Goetz and colleagues' critical review (*Physiol. Rev.* 55: 157, 1975) of some of the authors' concepts. The review constitutes a valuable source for graduate students, medical students, and teachers of physiology. It is a good survey for advanced courses in cardiovascular physiology.

L.B. Rowell

- 13 LOADING AND PERFORMANCE OF THE HEART AS MUSCLE AND PUMP. Brutseart, D.L. and Paulus, W.J... In: *Cardiovascular Research*, 11:1-16, 1977.

Although considerable information is available on the mechanical performance of isolated heart muscle, and on the performance of the heart as a pump, there is still considerable controversy as to how these two approaches relate to each other. This review discusses this question by interrelating concepts and studies in isolated heart muscle and the intact heart. In particular, the authors review the performance of isolated heart muscle under the changing loading conditions which are usually encountered in the intact heart; as opposed to the usual constant loading conditions which are employed in studies of isolated heart muscle. The review also explores the potential influence of the loading and length history of preceding contractions on subsequent contractions in isolated heart muscle, and then discusses the implications of these findings on the performance of the intact heart. These latter considerations include the effect of the Starling mechanism, the Laplace relation, vascular impedance, and the changing load throughout the course of contraction. Although a total and complete integration of muscle and pump function may not be possible, the concepts presented in this review are useful in making the transition between experimental studies in both of these areas. This article will be valuable to all students and faculty who are interested in either the performance of the heart as a muscle or in evaluating the performance of the intact circulation.

W.W. Farnley

- 15 NEURAL REGULATION OF THE HEART. Walter C. Randall (Editor). Oxford University Press, 1977.

This monograph admirably fills the editor's conviction to summarize the state of knowledge in many aspects of the neural regulation of the heart. Each chapter focuses on an important segment of cardiovascular regulation -- Changing hypotheses of cardiac control; Anatomy of the cardiac innervation; Sympathetic and parasympathetic control of the heart; Thoracic cardiovascular afferent nerves; Cardiac reflexes; Intracranial mechanisms of regulation; Spinal sympathetic control of the heart; Cholinergic and adrenergic control of the sinus node and AV junction; Neural influences on cardiac electrical excitability and rhythm; Autonomic control of the coronary circulation; Denervation and reinnervation of the heart; Neural control of the heart in the intact nonhuman primate; and The autonomic nervous system in relation to electrocardiographic waveform and cardiac rhythm. *In toto* it is a valuable source of current knowledge on a major segment of medical physiology and should serve well both teachers and researchers of cardiac physiology.

JAMES P. FILKINS

- 17 OVERALL CARDIOVASCULAR REGULATION. Öberg, B. *Annual Review of Physiology* 38: 537-570, 1976.

This is a good review of literature in this area published mainly after 1972. It is valuable mainly to investigators in this field and to graduate students with previous training in cardiovascular physiology. The review is limited to basic concepts concerning the involvement of neuronal and humoral control systems in the major cardiovascular reflexes. Emphasis is upon the efferent arm of reflexes of baroreceptor and chemoreceptor origin. Cardiac receptors also receive particular emphasis. Local control mechanisms are not discussed. The following major areas are reviewed: (1) afferent mechanisms for arterial baroreceptors and chemoreceptors, atrial and ventricular receptors; (2) efferent control of receptor function; (3) central mechanisms - medullary and spinal vasomotor areas; (4) efferent mechanisms - nervous and humoral pathways; (5) reflex patterns for arterial baroreceptors and chemoreceptors, atrial and ventricular receptors; and (6) integrated reflex responses. This is an up-to-date and concise treatment of current research and thinking about the reflex control of blood flow and blood pressure.

L.B. Rowell

- 18 PERIPHERAL CIRCULATION: FLUID TRANSFER ACROSS THE MICROVASCULAR MEMBRANE. Haddy, F.J., J.B. Scott, and G.J. Grega. In: MTP International Review of Science: Cardiovascular Physiology, 11, Vol. 9, pp. 63-109. Butterworth, London, 1976.

In this comprehensive overview and literature survey, the determinants of fluid transfer across microvascular membranes are discussed. After a brief coverage of the physical determinants of fluid transfer a more detailed account is given of the effects of naturally occurring vasoactive agents. After summarizing the evidence that an agent does alter fluid flux, explanations of the flux are then based on the discussion of physical determinants. The dependency of flux upon the route of administration of the agent is also discussed. A brief discussion of neural influences on fluid transfer is followed by a more detailed account of the influence of stresses such as exercise and ischemia. This survey and its extensive reference list will be particularly useful to graduate students and faculty whose principal interest is in cardiovascular physiology and particularly the peripheral circulation.

L.B. Rowell

- 20 REFLEX CONTROL OF THE PERIPHERAL CIRCULATION. Abboud, F.M., D.D. Heistad, A.L. Mark, and P.G. Schmid. Progress in Cardiovascular Diseases 58(5): 371-403, 1976.

This survey provides a uniquely broad but dense coverage of neuro-humoral regulation of every segment of the vascular tree within every major organ. It is best suited as a broad but condensed review for graduate students, medical students and physicians who have advanced training in cardiovascular physiology and for teachers of advanced courses in cardiovascular physiology. The extensive reference list is a valuable source. Some of the key methods used in man and other species are illustrated. Discussion of central nervous control includes as topics: (1) medullary centers and efferent pathways; (2) afferent neural stimuli; (3) central integration of reflexes; and (4) modulation of neural control by humoral factors. In this section, various receptors and associated reflexes such as chemo- and baroreflexes and their interactions are discussed. Reflex control of regional circulations in physiological and pathological states is described by examining: (1) adrenergic innervation and receptors in vascular segments; (2) responses of regional circulations to physiological stimuli; and (3) examples of adjustments in pathological states. This overview tends to focus upon the complexity of the system but it does emphasize several important concepts: (1) the significant role of cardiopulmonary receptors; (2) the degree of interaction between different reflexes; and (3) the differential control of each vascular region. The authors' integration of findings from man with those of other species is valuable.

L.B. Rowell

- 22 THE SARCOLEMMMA. Ed: Roy, P.E., N.S. Dhalla. In: Recent Advances in Studies on Cardiac Structure and Metabolism, Volume 9, pp. 489. University Park Press, Maryland 1976.

With but a few notables in the field absent, the authoritative text presents the latest research techniques and findings on the membrane's role in affecting myocardial contraction. Like most symposia, the book is oriented towards the experimentalist rather than the clinician. The contents should prove interesting to investigators and teachers in the field of basic cardiac mechanisms and those contemplating research efforts in this area. The multi-authored nature of the text presents some problems in continuity, however, the inclusion of concise, well-written summaries preceding each chapter is a great aid to the reader. The subject matter is divided into four sub-sections. The first, 'Physiological and Biochemical Aspects', is concerned with the sarcolemma regulatory role of Ca^{++} admittance into the cell which in turn, initiates the contractile event. Data are presented on both sides of the argument on the necessity of 'trigger Ca^{++} ' release from sarcolemma sites which includes the application of the stunning technique of skinned cardiac cells developing force with variations in the Ca^{++} concentration of the medium. 'Adenylate Cyclase and Catecholamines' constitute the second subdivision which looks into cyclic AMP action in modifying the basic calcium flux cycle to account for the myocardial inotropic response. In this section is found an excellent, short review on the effects of catecholamines, Ca^{++} , and cyclic AMP on the biochemical, electrical and mechanical action of the heart. The search for the 'Sarcolemmal Site of Action of Cardiac Glycosides' is so heavily buried in the jargon of the field that this third grouping of papers is difficult reading except for the initiated. The final aspect of the book takes up some 'Pathophysiological' findings in the sarcolemma of failing hearts.

John W. Manning

- 19 REFLEX CONTROL OF THE CIRCULATION BY HEART AND LUNGS. Mancica, G., R.R. Lorenz, and J.T. Shepherd. In: MTP International Review of Science: Cardiovascular Physiology, 11, Vol. 9, pp. 111-144. Butterworth, London, 1976.

This review surveys the evidence that receptors within the cardiopulmonary region, specifically lungs, atria, and ventricles, play a significant role in the regulation of arterial blood pressure, peripheral vascular resistance and blood volume. The perspective is broad and each section is well documented with an extensive reference list. The coverage includes the following: (1) location, nerve fiber type, etc. of receptors within the cardiopulmonary region; (2) a summary of the reflexes that emanate from the entire region, i.e., from the lungs and from the atria and ventricles; (3) role of the receptors in blood volume control through their effects on renal blood flow and on the secretion of hormones involved in regulation of salt and water balance; (4) interaction of reflexes from cardiopulmonary receptors with arterial baroreceptors and chemoreceptors; and (5) cardiopulmonary reflexes in hemorrhage, hypercapnia, myocardial ischemia, and infarction. This is a good review for graduate students and medical students with good backgrounds in cardiovascular physiology, and also for teachers of cardiovascular physiology.

L.B. Rowell

- 21 SALT, VOLUME AND THE PREVENTION OF HYPERTENSION. Fries, E.D. Circulation, 53:589-595, 1976, No. 4, April

Fries presents evidence supporting the thesis that hypertension can be prevented by eliminating extra salt from the diet based on four principal sources: (1) epidemiological studies in unacculturated peoples showing that the prevalence of hypertension is directly correlated with the degree of salt intake; (2) hemodynamic studies suggesting that the development of chronic experimental hypertension is a homeostatic response to a maintained increase in extracellular fluid volume (ECF); (3) evidence that the ECF of "salt eaters" is expanded in comparison to that of "no-salt eaters"; and (4) investigations in hypertensive patients receiving either diets greatly restricted in salt or continuous diuretic therapy which correlate the fall in blood pressure with a reduction in ECF. In his opinion the evidence is very good if not conclusive that reduction of salt in the diet to below 2 g/day would result in the prevention of essential hypertension and its disappearance as a major public health problem. This is an excellent review article as far as it goes. It would have been strengthened by more references to the numerous relevant animal models which are mentioned only in passing and by references to the protective effects of potassium. It should serve to lead the reader interested in the cause and control of hypertension into the voluminous literature on this subject.

G.R. Meneely

- 23 STRUCTURE AND MECHANISM OF HEMOGLOBIN. M. F. Perutz. British Medical Bulletin, Vol. 32 No. 3, September (1976), pp. 195-208.

The remarkable biological activity of hemoglobin is a function of its elaborate and unique structure. This paper brings together the latest information on the structure of hemoglobins and the functional correlates. The paper is divided into 3 sections: a) monomeric and dimeric hemoglobins; b) tetrameric hemoglobins; c) stereo-chemical mechanism of cooperative effects. Teachers of physiology will find this report a treasure house of information for keeping up to date on the molecular biology of hemoglobin. Students will find it demanding reading but well worth the effort. The illustrations are generous (10 figures), well done, and make their points. An impressive list of references is included; it insures that the reader may probe the subject even deeper if he so opts. As with most publications of British origin, this paper is well written despite its scientific rigor. It is recommended to teachers and to physiology students who wish to gain a sophisticated understanding of molecular structure: biological activity as illustrated by hemoglobin.

CHARLES G. WILBER

COMPARATIVE PHYSIOLOGY

- 24 ACID PRECIPITATION: EFFECTS ON FISH. C. L. Schofield. *Ambio*, Vol. 5, No. 5-6, pp. 228-230, 1976.

Serious decrease in the population of various fish species has been recorded in Norway, Sweden, and in parts of the Eastern United States. As the outcome of acidulation of lakes and streams, the toxic action of acid waters on the eggs and larvae of fish is the crucial cause of extinction of many of these fish populations. In the rivers of Southern Norway, acid stress which occurs during periods when the snow melts has been documented as the cause of mass mortality of populations of trout. There is a certain degree of tolerance to acid in fish. The tolerance phenomenon is a complex function which involves ecological as well as genetical factors.

Charles G. Wilber

- 25 COMPARATIVE MAMMALIAN RESPIRATORY MECHANICS. Leith, D. E. In: *Physiologist*. 19: 485-510, 1976.

This review, initially presented as a tutorial lecture, describes and compares relationships among such things as body dimensions, oxygen consumption, lung volume, transpulmonary pressure, and lung surface area in a number of air, sea and land-traveling mammals. It is shown that the wide range of conditions under which mammals live, and their anatomic differences, generate problems in respiratory mechanics which are often uniquely solved, although some striking similarities exist. Because it originated as a lecture, this review is written in a conversational style more exciting to read than the usual formal scientific prose. It is replete with brief and provocative questions, many of which are answered while the remainder serve as stimuli for the reader. This review provides an interesting introduction to a fascinating aspect of comparative physiology about which student curiosity is easily aroused. Originally intended for physiologists who were not pulmonary specialists, this material is suitable for undergraduate and graduate students in physiology who have mastered the first principles of respiratory mechanics. More advanced concepts are briefly explained, and sufficient references are cited to allow students to progress further on their own.

T. C. Lloyd, Jr.

- 26 EFFECTS OF SULFUR DIOXIDE ON TERRESTRIAL VEGETATION. W. Knabe. *Ambio*, Vol. 5, No. 5-6, pp. 213-218, 1976.

Sulfur dioxide in the gaseous form has an effect on vegetation in the surroundings of the source of the gas. The distance from the source over which vegetation will be affected varies with a number of circumstances such as wind, rain and the like. Small amounts of sulfur dioxide are absorbed by individual plant cells, by plants and by ecosystems; no harm seems to result from the uptake of small amounts of the gas by organic compounds. As the concentrations of sulfur dioxide increase, certain adverse reversible changes can be observed. Later one sees irreversible changes. Eventually a complete breakdown of the cellular, organismic or higher system occurs. The production of crops, the control of erosion, for example, are influenced at different concentrations of sulfur dioxides. Maximal concentrations of 0.05, 0.08, and 0.12 mg and SO subscript 2/m and 3 superscript (annual means) are sufficient to protect most-sensitive and less-sensitive plant species respectively.

Charles G. Wilber

- 27 LEAD ENRICHMENT IN SHELLS OF MYTILUS EDULIS. U. Stureson. *Ambio*, Vol. 5, No. 5-6, pp. 253-256, 1976.

Experimental studies have been made on lead in the shells of Mytilus edulis. The mussels were grown in tanks containing sea water. The sea water was spiked with lead at various concentrations: 0, 0.02, 0.10, and 0.50 microgram of lead per gram of sea water. The shells were broken up into the periostracum calcitic and calcitic aragonitic calcium carbonate and intercrystalline organic matrix. The samples were analyzed using the differential pulse anodic stripping method. All the shell fractions contained lead in concentrations greater than that in the surrounding water. The highest concentrations occurred in the older parts of the periostracum and in the newly laid down calcium carbonate.

Charles G. Wilber

DEVELOPEMENT AND AGING

- 28 THE BIOLOGY OF AGING. Burnet, F.M. Oxford University Press, New York, 1975.

The printing of a series of lectures delivered in 1973, this book represents a popularized short version of the Author's views on aging together with some candid and lively references taken from the Author's own successful career and current interests. The book reviews the theories of aging with emphasis on mutagenesis and genetic aspects. In particular, Burnet's discussion of the origins of aging-dependent diseases offers a lucid presentation of a complex subject.

Paola S. Timiras

- 29 A GOOD AGE. Comfort, A. Crown Publishers, New York, 1976.

Well-written and well-illustrated, this book presents a scientific review of the many aspects of aging masked under a literary, historic and socio-economic veneer. Topics such as changes with aging in skin, hair, muscles and blood-pressure, in nervous, sexual and endocrine functions, in incidence and severity of cancer, arthritis and other diseases associated with old age are discussed within the framework of today's society as it affects and is affected by the needs and rights of the old. Even though the book is concerned primarily with aging in humans, the competence of the Author in comparative physiology provides correlation between aging in man and other animal species. The respective roles of genetic and environmental factors on aging are examined, several theories of aging presented and hygienic and dietary measures discussed with great good sense. A very pleasant reading for those already knowledgeable in the biology of aging, this book serves as a very useful introductory text for those entering this complex area for the first time and would like to have a bird's-eye-view of the entire field of aging.

Paola S. Timiras

- 30 HYPOTHALAMUS PITUITARY AND AGING. Everitt, A.V. and Burgess, J.A., editors. Charles C. Thomas, Springfield, Illinois, 1976.

Of the many theories of aging, one which is gaining considerable support examines the relationship between the phylogenetic differences in aging and the increase in size of the brain and development of the endocrines. In this view, neuroendocrine integrations responsible throughout the lifespan for the regulation of reproduction, metabolic processes and homeostasis would also play a crucial role in the regulation of aging processes and duration of the lifespan. However, until recently, experimental and clinical evidence for the involvement of the hypothalamic-pituitary axis in aging has been relatively scarce and widely scattered in the gerontological and endocrine literature. In the past decade, the interest in these areas has resulted in the publication of a large enough number of investigations to warrant a preliminary synthesis of the material into a comprehensive treatise. The present volume includes 34 chapters and an appendix written by the editors and 37 contributing authors and rather loosely grouped to discuss pathology of aging, aging changes in the functional capabilities of the hypothalamus, pituitary, and other endocrine glands, influence of hormones on aging of various tissues, concept of aging as controlled by an "aging clock", the importance of environmental factors on aging, etc. Even though the book does not cover some important aspects such as the role of neurotransmitters in the regulation of neuroendocrine functions and aging for which there is now considerable evidence, it represents a valuable contribution to our understanding of aging and can be used both as a textbook and as a reference book.

Paola S. Timiras

ENDOCRINOLOGY AND METABOLISM

- 32 LABORATORY METHODS MANUAL FOR HORMONE ACTION AND MOLECULAR ENDOCRINOLOGY. Schrader, W.T. and O'Malley, B.W., eds., 350 pp. Houston Biological Associates, P. O. Box 35484, Houston, Texas 77035 (1977)

This manual is one of the more effective methods books written. It serves as a syllabus for a workshop in molecular endocrinology. Advanced students and investigators seeking entry into this area of study will be highly satisfied with the proven operational character of this book. It seeks to keep current with the advances in technology for the study of hormonal effects on gene expression which have been extensive. Methods are now available for measuring and characterizing steroid and peptide hormone receptors, protein kinases, adenyllyl and guanylyl cyclases and the effects of these agents on RNA and protein synthesis. This manual, designed as a practical laboratory guide, contains detailed protocols and descriptions of methods ongoing in the editors' and contributors' laboratories. In addition to the above, the manual describes methods for messenger RNA isolation and characterization, hybridization probes and analysis, *in vitro* protein synthesis, nuclear-exchange assays for nuclear steroid receptors, chromatin and nuclei isolation, *in vitro* RNA synthesis and initiation site measurements. A chapter on tissue culture techniques is oriented toward endocrine studies. The manual is well-referenced and up to date and would be an excellent laboratory guide for investigators and preceptors interested in adapting methods in molecular biology to their own studies in Endocrinology.

S. R. Glasser

- 34 THE THYROID AND ITS DISEASES. Fourth Edition. DeGroot, L.J. and J.B. Stanbury. John Wiley and Sons, New York, 1975.

This monograph is a comprehensive 823 page treatise which deals both with the basic biology and the medical considerations in the study of the thyroid gland. The first 195 pages review the basic anatomy, biochemistry and physiology of the thyroid in unusually succinct, thorough and up-to-date fashion. The remaining pages deal with the nature, diagnosis and treatment of thyroid diseases. This book is a good text for both students and clinicians.

W. Tong

- 31 IN VITRO SENSATION OF MAMMALIAN CELLS. Choe, B-K and N.R. Rose. Gerontology 22:89-108, 1976.

Aging discussed in this review is related to diploid fibroblasts which undergo mitotic division throughout their adult life. The review is current and is part of a continuing discussion of the significance of Hayflick's observations that embryonic fibroblasts undergo a finite number of population doublings before the culture expires. The usual interpretation is that explaining the loss of viability can be used to help interpret the aging processes. Cell cycle, cell hybridization, functional changes observed and the genetic basis for aging are considered from a molecular and cytokinetic viewpoint. How these observations relate to the error and the programmed theories is then considered. The information is presented in a clear fashion. It should be useful to graduate students and faculty interested in a summary discussion of cell culture as it relates to the biology of aging.

H. M. Frankel

- 33 PERINATAL THYROID PHYSIOLOGY AND DISEASES. Edited by Fisher, D.A. and G.N. Burrow. Kroc Foundation Series, No. 3, Raven Press, New York, 1975.

This volume presents the proceedings of a meeting comprised of twenty one papers which reported recent findings on the following topics: (1) maternal-fetal thyroid physiology, (2) the effects of thyroid hormone on development, (3) thyroid disease in pregnancy and the newborn, and (4) newborn screening for hypothyroidism. Each paper presents not only some new data, but includes also a very useful review of the subject and pertinent references. Following each paper is a record of the comments made during the discussion of the paper by participants at the meeting. This book provides the most up-to-date survey of hypothalamic-pituitary-thyroid function in the fetus and neonate. It will be useful to advanced students and researchers in biology and medicine.

W. Tong

- 35 THYROTROPIN-RECEPTOR INTERACTION AND CYCLIC AMP-MEDIATED EFFECTS IN THYROID CELLS. Lissitzky, S., G. Fayet and B. Verrier. In: Advances in Cyclic Nucleotide Research, Vol. 5, edited by G.I. Drummond, P. Greengard and G.A. Robison, Raven Press, New York, 1975.

This article provides a concise review of current concepts of the mechanism of action of TSH. The discussion focuses almost exclusively on findings from *in vitro* experiments. Thus, the following major topics are dealt with: (1) effects of TSH on the morphology of thyroid cells in culture, (2) the role of the adenyl cyclase-cyclic AMP system in mediating TSH actions, and (3) TSH binding to thyroid cells and thyroid cell plasma membrane preparations. This review will be useful to advanced students and teachers.

W. Tong

ENVIRONMENTAL AND EXERCISE PHYSIOLOGY

- 36 ACID PRECIPITATION: EFFECTS OF SULFUR DIOXIDE AND SULPHATE AEROSOL PARTICLES ON HUMAN HEALTH. Coffin, D. L., and J. H. Kneison. *Ambio*, Vol. 5, No. 5-6, pp. 239-246, 1976.

There is some evidence available that sulfur dioxide as an air pollutant can have an adverse effect on human health. Of greater concern is the fact that the oxidation products of sulfur dioxide are much more irritating than sulfur dioxide itself. Population surveys have been made in areas where suspended sulphate was also found in air along with the sulfur dioxide. The results of the surveys indicated that the number of adverse health reactions are associated more strongly with the sulphate than with the sulfur dioxide. Through the use of biological modeling there is reason to suggest that sulphates and sulphuric acid act on the lung by releasing histamine; the degree of histamine released is related to the specific cation which is present in the air. This paper indicates that serious attention must be given to sulphates and to specific cations in all monitoring of the atmosphere for environmental variables.

Charles G. Wilber

- 38 DDT AND PCB LEVELS AND REPRODUCTION IN RINGED SEAL FROM THE BOTHNIAN BAY. Helle, E., M. Olsson, and S. Jensen. In: *Ambio* 5 pp. 188-189. 1976.

This paper is a concise summary of the effects on mammalian reproduction of 2 man made environmental contaminants. The Baltic area is seriously contaminated with DDT and PCB. At the same time there has been a swift decrease of the Baltic Sea populations. For example in Bothnian Bay contamination is high and about 27 percent of the female seals are pregnant; in relatively unpolluted areas 80-90 percent pregnancy is found. Apparently implantation occurs followed by resorption or spontaneous abortion. Cross comparisons with other seal populations suggest that PCB but not DDT is the causal agent in failure of reproduction. The paper is short enough to reproduce for students' notes. Eighteen references are included.

Charles G. Wilber

- 40 EXERCISE: I, II, & III, edited by E.H. Sonnenblick and M. Lesch. In: *Progress in Cardiovascular Diseases*. I, vol. 18, no. 6, p. 421-495, 1976; II, vol. 19, no. 1, p. 1-68, 1976; II, vol. 19, no. 2, p. 91-116, 1976.

These reviews comprise a survey of several important aspects of the responses of the cardiovascular system to exercise and are a valuable source of information on many current areas of interest in the effects of exercise on cardiovascular function. There is a total of nine review articles which cover the following topics: (1) Aging and exercise, (2) Regulation of the peripheral circulation in exercise, (3) Cardiac responses to exercise, (4) Biochemical changes in muscle associated with training, (5) Effects of physical training on the cardiovascular responses to exercise, and (6) Methods for the quantitation of exercise capacity and stress testing. The articles are not a complete overview of the field of the cardiovascular effects of exercise, although most important topics are covered to some degree. Material is presented largely from the point of view of the research scientist and an extensive background in cardiovascular physiology is assumed. This material would be suitable for an intermediate level course in cardiovascular physiology, or as supplemental material for a medical school course.

B.R. Duling

- 37 THE BIOLOGY OF PHYSICAL ACTIVITY. Edington, D.W. and V.R. Edgerton. Boston: Houghton Mifflin Co., 1976, 371 pp.

This recent addition to the field of exercise physiology is designed as a basic text for advanced undergraduates and/or beginning graduate students with a limited background in physiology. The book contains twenty chapters which have been subdivided into five specific units which are: orientation to exercise, muscle and energy, neurological aspects of movement, energy support systems of movement, and the applied biology of physical activity. Chapters are included on topics that are frequently covered in a cursory manner in basic texts; namely, growth, the female athlete, hormonal factors and pharmacological agents. The expertise of the authors are well demonstrated in the chapters and illustrations concerned with histology, cellular metabolism, nerve and muscle function, and neuromuscular control. Each chapter lists key concepts pertaining to the subject matter. This is a definite advantage because it allows flexibility in the supplementation of related material. Review questions and selected references are included; however, it would have been more useful if the statements had been documented throughout the text. Minor detractors were the inadequate coverage given to the autonomic nervous system, a diffuse presentation on the problems of dehydration, the sparse use of mathematical formulas to describe physiological relationships and the avoidance of controversial issues. Even so, exercise physiology instructors would be well advised to examine this text for their future needs.

Charles M. Tipton

- 39 DEPENSES ENERGETIQUES DES POPULATIONS HIVERNANTES DE PINSONS DU NORD (*FRINGILLA MONTIFRIGILLA*) EN RELATION AVEC LEUR MILIEU. Hemery, G. and A. LeToquin. In: *La Terre et La Viex* 30, pp. 52-88.

Bramblings winter in western Europe regularly in flocks of several million birds. This detailed physiological study was done to generate a general model which would relate the amount of energy expended daily to the behavior of the Bramblings during their wintering and to variables in the habitat. The result is a delightful study in environmental physiology. The paper is broken into four parts: different levels of metabolism are related to body weight and the relation of flight metabolism to resting are established; the previous information is applied, e.g. an individual bird flying 80 dm/day expends 28 kcal; the overall energy economy is worked out; a general model is proposed and tested by simulation.

Charles G. Wilber

- 41 HEALTH PROBLEMS ASSOCIATED WITH NITRITES AND NITROSAMINES. Lijinsky, W. In: *Ambio* 5, pp. 67-72.

Human exposure to N-nitroso compounds is brought about in part by residual nitrite permitted in cured meats and fish. The N-nitroso compounds are among the most potent carcinogens known. The process of formation of these dangerous compounds is outlined. The reactions can take place in the human stomach which then would be a significant source of carcinogens in the body. The setting of standards for nitrites and nitrate in cured meats is arbitrary: in the U.S.A. 200 ppm nitrite, 500 ppm nitrate. These values happened to be found in cured foods at the time standards were set. Elimination of most nitrates and nitrites as food additives seems warranted. That failing, the public should consider eliminating the offending foods from the diet. 27 references to the literature are included.

Charles G. Wilber

- 42 HYPOTHERMIA IN BIOLOGY AND IN MEDICINE. Vojin Popovic and Pava Popovic. Grune & Stratton, Inc., New York, 305 pp. 1974.

This monograph is written in a straightforward succinct style; the authors had the expressed goal of accumulating the important literature of Hypothermia in one volume and synthesizing the major experimental and clinical findings of the last 20 years in the subject of low temperature physiology. The chapters and the bibliography are conveniently classified according to organ system, and by other topics such as "Differential Hypothermia." The bibliography of 1,859 titles does not quite overshadow the text, and one gets used to a word or topic having as many as 37 exponents, each of which represents a specific reference. The main question posed by the authors is "why can a profoundly cooled animal or patient survive only a few hours while hibernators live for weeks or months at low body temperatures?" Dr. Adolph once stated that there are large bodies of detached information on the physiology of hypothermia, but this is not yet crystallized to explain how hypothermia limits life. The Popovic team has taken a large step forward in crystallizing the explanation of hypothermic effects for the clinician, the physiologist, and the biologist.

G. Edgar Folk, Jr.

- 44 PSYCHOLOGICAL ASPECTS AND PHYSIOLOGICAL CORRELATES OF WORK AND FATIGUE. Simonson, E. and P.C. Weiser (Eds). Charles C. Thomas, 445p., Springfield, 1976.

This companion volume to the first volume published in 1971 entitled Physiology of Work Capacity and Fatigue represents an attempt to integrate the psychophysiological literature on fatigue and deterioration in work capacity. The subject matter covered is divided into seven sections: Biophysical Models and Physiological Background, Motor Aspects, Sensory Aspects: Vision, Aspects of Central Processing, Aging, Introspective Aspects of Work and Fatigue and Closing Comments. Of note, is the fact that several German Investigators who have worked in the area for a number of years have contributed to the volume. Their work is not as well known in the U.S. as it might be. Since the various chapters in the volume have excellent bibliographies and the author and subject indexes have been well prepared the investigator interested in fatigue should find the volume a valuable reference source. Although fatigue is not explicitly identified, various ramifications of the multiplicity of fatigue processes are explored. The volume is one of those not likely to be duplicated or rewritten for years to come but which together with its companion volume should be on the shelves of those concerned with industrial or work physiology.

E.R. Buskirk

- 43 A REEXAMINATION OF THE INFLUENCE OF MUSCLE LENGTH ON MYOCARDIAL PERFORMANCE. B.R. Jewell, *Circulation Research*, 40:3, March 1977, pp. 221-230.

This review carefully examines the length tension characteristics of the myocardium as primarily determined from papillary muscle. The author arrives at the following conclusions: 1) length-dependence of activation accounts almost entirely for the dependence of tension production on muscle length over the ascending limb of the length-tension relation in isolated papillary muscles; 2) if the inotropic state of the muscle is equated with the degree of activation of the contractile system, then muscle length influences inotropic state and a change of muscle length must therefore be regarded as an inotropic intervention; 3) if these results are applicable to the intact heart, then diastolic volume and inotropic state cannot be regarded as independent regulators of cardiac output.

E.R. Buskirk

- 45 ON THE ROLE OF THE TROPOSPHERIC SULFUR CYCLE IN THE SHORTWAVE RADIATIVE CLIMATE OF THE EARTH. Bolin, B. and R. J. Charlson. *Int. Ambio* 5, pp. 47-54. 1976.

Environmental physiologists concerned with problems of insolation will find much of interest in this article. In the eastern U.S.A. and in western Europe a haze cloud hangs over the areas. Sulfur particles make up this cloud to a significant degree. There is evidence that in the polluted zones the scattering of the sun's radiation may be equivalent to a decrease in temperature of several degrees C. Ventilation in fact reduces the effect. With increased use of sulfur-containing fossil fuels we are shortening the advent of indirect effects on climate that may be comparable to natural changes that took tens and hundreds of years to occur. Twenty-nine references are included. The illustrations are effective.

Charles G. Wilber

GASTROINTESTINAL PHYSIOLOGY

- 46 INTESTINAL ABSORPTION IN MAN. McColl, I., and G.E.G. Sladen. (editors) Academic Press, London, 1975.

This volume contains 8 chapters dealing primarily with recent advances in our understanding of intestinal absorption in man. Although the emphasis is decidedly on human studies, relevant findings from studies on *in vivo* or *in vitro* preparations of small intestine from other animals are cited. The topics covered include (1) a review of methods employed in evaluating intestinal absorption in man; (2) the absorption of fluid and electrolytes; (3) carbohydrates and lipid absorption; (4) the digestion and absorption of proteins; (5) calcium and iron absorption; and (6) the effects of humoral and pharmacologic agents on absorptive processes. Each chapter is heavily referenced and reasonably up-to-date. Because of its emphasis on man, this volume represents an important complement to other texts or chapters dealing with intestinal absorption. It is recommended for students and teachers of mammalian physiology, and particularly medical students and those responsible for the education of medical students.

S. G. Schultz

- 47 PHARMACOLOGY OF INTESTINAL ABSORPTION: GASTROINTESTINAL ABSORPTION OF DRUGS. Forth, W. and W. Rummel, editors. Section 39B, Vol. I, 1975. Pergamon Press, New York.

Section 39B of the International Encyclopedia of Pharmacology and Therapeutics covers that part of gastrointestinal pharmacology which deals with (a) absorption processes in the GI tract and (b) the influence of drugs on these processes. The structural basis of intestinal absorption is reviewed in 70 pp. and the physiological and biochemical implications of intestinal absorption are reviewed in about 100 pp. The activation and inhibition of intestinal absorption by drugs and the role of bile acids is covered, as are the principles of drug absorption. Physical properties and pharmaceutical manipulations influencing drug absorption are reviewed as is the intestinal absorption of water-soluble vitamins. Experimental data is often included as tables and graphs which in most cases would make good lecture slides. An encyclopedic list of references follows each chapter. Volume II of this series deals with the gastrointestinal absorption of hormones, alkali ions, alkaline earth ions and heavy metals. Inherited defects of intestinal absorption, methods for the investigation of absorption in animals and clinical methods for measuring GI absorption are also included. Vol I :1-446 pp. Vol II :pp. 447-819.

P. H. Bogner

- 48 SECRETIN, CHOLECYSTOKININ AND NEWER GASTROINTESTINAL HORMONES. Rayford, P.L., T.A. Miller and J.C. Thompson. New Eng. J. Med. 294:1093-1101 and 1157-1164, 1976.

A concise, heavily referenced and excellent review of the chemistry, distribution, release, actions and catabolism of secretin and cholecystokinin as well as brief, but informative, discussions dealing with the "newer gastrointestinal hormones" (or "candidate hormones") such as GIP, VIP, chymodinin, etc. whose hormonal status and physiological roles of actions are not fully established. A valuable review for students and teachers of mammalian physiology.

S.G. Schultz

- 49 SECRETIN, CHOLECYSTOKININ AND NEWER GASTROINTESTINAL HORMONES. Rayford, P.L., T.A. Miller, and J.C. Thompson. N. Engl. J. Med. 294:1093-1101, 1157-1164, 1976.

This review was probably intended to bring clinical gastroenterologists up to date with respect to the current status of known gastrointestinal hormones and various polypeptides which have been reported to influence gastrointestinal secretory-motor activities. The first section gives an exhaustive review of the literature pertaining to secretin and cholecystokinin to include structure-activity, assay, physiological function, release, and catabolism, and a perfunctory treatment of gastrin. The latter portions summarize the literature pertaining to glucagon and various polypeptides of current interest such as gastric inhibitory polypeptide, vasoactive intestinal polypeptide, bombesin, motilin, chymodinin, bulbogastrone, entero-oxyntin and pancreatic polypeptide. This review would be of limited but definite value to an advanced graduate student working in a particular area because it would provide some references to that area. It would be more valuable to a teacher of a basic physiology course because it is considerably up to date with reference to current basic textbooks which say little concerning such topics of current research interest as somatostatin and the use of radioimmunoassay for the direct assay of very small quantities of circulating hormones and polypeptides.

M.F. Tansy

- 50 SYMPOSIUM ON "HISTAMINE H₂- RECEPTOR ANTAGONISTS", FALL MEETING OF THE AMERICAN SOCIETY FOR PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS. In: Federation Proc. 35: No. 8, pp. 1923-1952, June, 1976.

The gastrointestinal pharmacologist and the teacher of a basic physiology course who is concerned with keeping up to date on the mechanisms of histamine-induced gastric acid secretion will find the proceedings of this symposium to be of interest. The participants are the researchers who literally "wrote the book" about histamine H₂ receptors and their antagonists. The five articles in these proceedings deal with: 1) the chemical aspects of H₂- receptor antagonists; 2) the pharmacology of burimamide and metiamide, two histamine H₂- receptor antagonists; 3) studies on vascular H₂ receptors; 4) cardiac histamine receptors; and 5) the effects of H₂-receptor blockade in man. Preceding the articles is a short introductory commentary by Andres Goth. In light of the above, it is the opinion of the writer that this symposium will stimulate a large amount of research on the riddle of histamine.

M.F. Tansy

- 51 SLIDE TAPES ON HEPATIC EXCRETORY FUNCTION -- BASIC AND CLINICAL SERIES. Norman B. Javitt and Henry O. Wheeler (Editors). Available from the National Audiovisual Center (GSA), Washington, D.C. 20409.

The basic series consists of six tape cassettes with 35 mm slides and covers: The functioning unit; Composition and physico-chemical properties of bile; The sinusoidal membrane and hepatic uptake; Organic solute transport; The determinants of bile flow; and Gallbladder function. Each segment is authored by an authority in the area under the auspices of the American Gastroenterological Association. The slides are of excellent quality and well-coordinated to the scripts. The series fills the need for the essential coverage of liver and biliary tract physiology which is all too often deleted from medical physiology courses.

The clinical series consists of eight tape cassettes with 35 mm slides and covers: The BSP test; Mechanisms and differential diagnosis of jaundice; Unconjugated hyperbilirubinemia; The cholestatic syndrome; Cholesterol gallstone formation; Clinical aspects of cholelithiasis; Oral cholecystography; and Cholangiography. The complete clinical series is a fitting complement to the more fundamental hepatology covered in the basic series. The quality of slides and scripts is excellent. The set is ideally suited to an independent enrichment program.

JAMES P. FILKINS

- 52 TWO DECADES OF GASTROINTESTINAL RESEARCH. A PERSPECTIVE. L.M. Nyhus. Am. J. Surg. 131:3-18, 1976.

This paper is a reprint of a presentation made by the fifteenth President of the Society for Surgery of the Alimentary Tract to an annual meeting of that group. The first half of the presidential address consists of an intelligent discussion of the cost-benefit strategy involved in the therapeutic use of truncal versus selective vagotomy in the treatment of ulcer disease of the duodenum. This serves as the appetizer for some experimental data of his own and references to current literature which explain his preference for the latter strategy. The author makes a strong case for a mechanistic cellular approach to define the concepts of gastrointestinal research including examples of degeneration of nerve axons which innervate parietal cells and the granule depletion of enterochromaffin cells following vagotomy. This paper and its references would be of value to the physiology teacher who is interested in current developments and alternative concepts concerning the role of neurosecretion and gastrointestinal secretory processes.

M.F. Tansy

MUSCLE PHYSIOLOGY

- 53 THE CONDUCTION SYSTEM OF THE HEART: STRUCTURE, FUNCTION AND CLINICAL IMPLICATIONS. Wellens, H.J.J., K.I. Lie and M.J. Janse. 708 pp. Lea & Febiger, Philadelphia, 1976.

This monograph resulted from a meeting organized to update our knowledge of the structure and function of cardiac conduction tissue and to emphasize the clinical implications of the findings. The subject matter is presented in seven sections: (1) anatomy and electrophysiology of the developing conduction system; (2) electronmicroscopy of the conducting system; (3) impulse formation and conduction; (4) sinus node and atrium; (5) atrioventricular junction, bundle branches and the ventricle; (6) Wolff-Parkinson-White syndrome; (7) myocardial infarction. Although the scope of the monograph is somewhat unevenly balanced, it is both well-illustrated and documented (963 references) and should prove to be a useful source book for medical students, clinicians and faculty interested in normal and abnormal cardiac conduction. Graduate students in physiology and pharmacology will find the book to be informative but quantitatively inadequate in explaining the mechanisms underlying the reported observations.

M. Lieberman

- 54 MACROMOLECULES OF THE EXTRACELLULAR COMPARTMENT OF EMBRYONIC AND MATURE HEARTS. Manasek, F.J. Circulation Research 38:331-336, 1976.

This brief, well-referenced review draws attention to the physiologic importance of the extracellular matrix of cardiac muscle. The microscopic appearance of the extracellular space is clearly described and defined in terms which should be uniformly adopted by cardiac physiologists. The chemical composition of the extracellular matrix in the embryonic and adult heart is described by three general types of macromolecules-collagen, glycosaminoglycans and glycoproteins. The origin of cardiac extracellular macromolecules and their role in congenital cardiac abnormalities is summarized. Emphasis is placed on the fact that the changing composition of the extracellular matrix, even in mature hearts, can be important in controlling cardiac function. Although the author cites gaps in our knowledge of the extracellular space in cardiac muscle, he has clearly succeeded in alerting the cardiac cellular physiologist to potential problems which can arise from the morphological and biochemical complexities of the tissue architecture.

M. Lieberman

NEUROBIOLOGY

- 55 ADRENERGIC NEURONS: THEIR ORGANIZATION, FUNCTION AND DEVELOPMENT IN THE PERIPHERAL NERVOUS SYSTEM. Burnstock, G. and M. Costa. John Wiley & Sons, Inc., New York, 1975.

This monograph describes the physiology, biochemistry, pharmacology and structural characteristics of mammalian peripheral adrenergic neurons. As such, it is an excellent complement to Gabel's "Structure of the Autonomic Nervous System." It is thoroughly referenced and should be valuable for advanced graduate students and faculty desiring a concise, authoritative overview of the enormous and continuously growing area of autonomic physiology. The topics covered include: (1) organization, structure and function of adrenergic neurons and related cells; (2) biosynthesis and metabolic degradation of norepinephrine; (3) adrenergic neuroeffector transmission; (4) growth and degeneration of adrenergic neurons; (5) general discussion emphasizing the heterogeneity of the adrenergic neurons and its possible functional implications.

J.M. Marshall

- 56 BRAIN UNIT ACTIVITY DURING BEHAVIOR: Edited by M. Ian Phillips, Charles C. Thomas, Publisher, Springfield, 1973.

This book provides some of the basic technology of how to record from the brain in freely moving animals. Detailed methods used by several investigators are described in the first part of the book including methods of electrode construction, electrode implantation, problems of brain movement artifact, telemetry, simple implanted microdrives, recording equipment, data acquisition and methods of analysis. Problems associated with the interpretation of data, such as whether the recording obtained is from axons or the somata-dendrites of the neuron are discussed. Also dendritic spikes and volume conductor theory are covered in the first chapter. Subsequent chapters by different authors examine quantification of subcortical single and multiple units, a telemetry system for the transmission of single and multiple channel data from individual neurons, an on-line computer technique for display and analysis of single cell activity, a moveable microelectrode for recording from single neurons and implantable monolithic wafer recording electrodes. The second part of the book looks at specific problems being investigated with unit activity studies in the awake animal. Some of the topics covered are: relationship of neuronal activity to EEG waves during sleep and wakefulness, unit activity during operant conditioning, the activity of neurochemically defined neurons with behavior, and bursting cells in the cerebellar cortex during sensory stimulation. This book will be most appreciated by young investigators and graduate students who are about to assess the feasibility of recording from various brain structures in the awake and freely moving animal.

Donald H. York

- 57 FROM NEURON TO BRAIN. Kuffler, S. W. and J. G. Nicholls. Sinouet Assoc., Inc., Sunderland, Mass., 1976.

This book is notable in that it starts with the visual system and emphasizes the Hubel and Wiesel approach. Since the discussion can be understood with minimal reliance on precise mechanisms of electrophysiology the student can be enticed into the subject with a feeling of understanding and success. This leads to a realization that the mechanisms for neuronal signaling would be both useful and interesting and part two of the book deals with that very topic. Here it includes the work of Hodgkin, Huxley, Katz and Miledi in an effective manner, giving a general discussion of each problem before presenting the data and exact theories. It adequately covers ionic basis of membrane potentials, control of membrane permeability, synaptic transmission and active transport. Part three considers the brain environment, a topic often ignored in neuroscience texts. Part four discusses sensory receptors and part five examines the transformation of information including the leech's "simple" nervous system. The sixth and last part on nature and nurture considers neuronal specificity and then completes the cycle with the visual system again, only this time adaptability and modification are stressed. The depth of coverages and references amply compensate for the omission of other neurophysiology topics such as the cerebellum. The book is accessible to advanced undergraduates and graduates in physiology and in psychology.

N. A. Dahl

- 58 ILLUSTRATED LECTURES IN NEUROPHYSIOLOGY. Beverly Bishop and Dorothy D. Greenhouse (1977). Dept. of Physiology and Research Inst. on Alcoholism. SUNY at Buffalo, Buffalo, N.Y. 14214. To be available Sept. 1977 from AV/MD, 850 Third Ave. NYC, 10022.

This package contains two new illustrated lectures in neurophysiology which will become part of an existing series. These lectures deal with a) Distribution and structure of muscle spindles and b) Determinants of muscle spindle discharge patterns. Each lecture is recorded on a tape cassette and illustrated by 14 figures in a spiral bound notebook to be synchronized by hand. At the end of the illustrations are some twenty posttest questions. The lectures are 20 minutes long for a total running time of 40 minutes. This material would be most suitable for a variety of students in the biological or medical sciences. The first tape (lecture 25) starts with the distribution, anatomy and classification of spindles together with their sensory and motor innervation. The second tape (lecture 26) deals with spindle function as revealed experimentally by passive muscle stretch. It then examines effects of gamma bias, root sections, primary and secondary responses and dynamic versus static aspects of function. These two tapes and illustrative material are of excellent quality and pitched at a level to be comprehended by freshman medical students.

Donald H. York

Editor's note: The two lectures described above are the first two of a package of six lectures dealing with the structure and function of muscle and joint receptors. The package will contain 6 twenty minute lectures on 3 cassettes, 1 book of illustrations, 1 question and answer booklet, and slides loaded in carousels.

- 59 **INTRACELLULAR STAINING IN NEUROBIOLOGY**, Edit. by Stanley B. Kater and Charles Nicholson. Springer-Verlag, New York 332 pp. 1973.

A technical development, the use of intracellular stains injected into neurones through recording microelectrodes, has allowed neurophysiologists to correlate the physiological performance of nerve cells with their exact geometry. Successful application of these techniques requires more information than can usually be encompassed in the "Methods" section of a research paper. This volume collates much of the information that will allow readers to acquire expertise in visualization of individual neurones. The chapters include a history of the discovery of intracellular stains, material on their chemistry, fundamentals of fluorescence microscopy and helpful technical details on difficult aspects of preparation of electrodes and injections into difficult material. Computer analysis of cell architecture is addressed as well as the use of multiple-injection techniques to study small networks of interacting neurones. Several of the chapters review the major advances in the field and are written by the scientists who made the discoveries. Other chapters are the result of a two-day conference on intracellular recording and staining in neurones held at the University of Iowa. The discussion sections following these symposium chapters are particularly helpful.

The use of demonstration slides with individually injected neurones in neurophysiology class and laboratory has been very useful in my experience. This book makes available the possibility of using injected-dye techniques for the study of cytoarchitecture to teachers of physiology and to students who may wish to undertake research projects.

N.S. Milburn

- 61 **MANUAL OF ELECTRONEUROMYOGRAPHY**: Cohen, H.L. and Brumlik, J.; Harper & Row Publishers, Hagerstown, 1976.

This short book of five chapters is a fairly comprehensive manual describing the techniques of nerve stimulation, electromyograph (EMG) and electrodiagnosis with a chapter on illustrative case reports. For the physiologist it provides a detailed description of various surface electrodes, needle electrodes and recording equipment required to undertake nerve conduction or EMG studies from human subjects. Chapter two demonstrates pictorially the precise placement of stimulating, recording and ground electrodes for a variety of limb nerve conduction studies and the type of records that will be observed. There is a good discussion of sensory conduction studies compared to motor conduction studies. H-reflex testing and studies of the myoneural junction are also covered. Tables of normal values for nerve conduction velocity for sensory and motor nerves are given. Chapter three covers needle electrode studies and the characteristics of EMG potentials in terms of amplitude, duration, waveform, frequency and sound. The final two chapters of the book are devoted to electrodiagnosis and illustrative case reports. This book as well as being of tremendous value to the clinician is most useful for the physiologist in the demonstration of basic principles of nerve axon and muscle physiology in the human, whether as a laboratory exercise for medical students or to illustrate a particular point as a lecture demonstration.

Donald H. York

- 63 **NERVE AND MUSCLE EXCITATION**. Jung, D. Sinauer Assoc. Sunderland, Mass., 1976.

This is a useful little book (143 pages) with the admirable inclusion of problems for the students to solve. It was highly successful as a beginning text in a class of graduate students. It is aimed at advanced undergraduate and graduate students with a background in basic science. It will be difficult for the student with little physics or chemistry though the inclusion of the problems make it possible. The first two chapters include a bit of history and of general electrophysiology such a discussion of action potentials. Subsequent chapters include: 3 membrane analogue, 4 ionic properties of resting and active membranes, 5 voltage clamping, 6 the Hodgkin-Huxley model and other theories of excitation, 7 independence of the sodium and potassium channels, 8 divalent ions as charge carriers, 9 metabolic pumps and membrane potentials, and 10 new directions. It would improve the book if there were more than six pages devoted to synapses and generator potentials. Perhaps both discussion and problems on the myoneural junction should have allowed greater comprehension. The other missing topic is dendritic electrotonus. This might be incorporated in the chapter on the membrane analogue, somewhat in the fashion of Shepherd's chapter 5 in *The Synaptic Organization of the Brain* (Oxford Univ. Press., 1974). Such a discussion with accompanying problems would greatly add to the usefulness of the book. In spite of its limited coverage the book is still highly useful in providing a lucid account and illustrative problems on an important area of neurophysiology.

N. A. Dahl

- 60 **INTRODUCTION TO BASIC NEUROLOGY**: Patton, H.D., Sundsten, J.W., Crill, W.E., and Swanson, P.D. W.B. Saunders. Philadelphia. 1976.

This book is intended to substitute for Volume I of the 20th Edition of Ruch and Patton's *Physiology and Biophysics* which has never been published. Medical students react enthusiastically to Patton's excellent writing style. His chapters include those concerned with resting and action potentials, muscle and neuromuscular transmission, receptors, synaptic transmission, reflex physiology, vision, audition and sensory physiology. The other authors are anatomists and neurologists who are responsible for the remaining chapters on other aspects of the nervous system. Inevitably, their treatment of the physiological aspects of nervous activity are less incisive, less comprehensive and less interesting to medical students than that offered by Patton. The book provides coverage of the nervous system for courses featuring an integrated, multidisciplinary approach with clinical emphasis. Chapters on brain metabolism and vasculature are excellent but the anatomical aspects of other chapters are not consistently adequate. The clinical examples are both superficial and too specific to be very useful at this stage. The difficult search for a neurophysiology text which is both suitable for and attractive to medical students is only partially met by this book. The need for a new Volume I of Ruch and Patton is all the more evident.

L.M.N. Bach

- 62 **MOVEMENTS OF ORGANELLES IN LIVING NERVE FIBERS**. Forman, D. S., A. L. Padien and G. R. Siggins. National Audiovisual Center, National Archives Trust Fund. Washington, D. C., 20409, 1976.

This excellent film is available at cost from the National Audiovisual Center. It accomplishes the dual functions of illustrating a fact and providing pleasure. From the factual point of view the title is an accurate description. Motor neurones are pulled apart and magnified until the diameter of one axon fills the screen and then the optics are altered so that the moving organelles are visible. It graphically demonstrates how small particles move in saltatory fashion, move back and forth, stop and move again. Mitochondria movements are fascinating. It shows the effect of cooling and warming. It points out that most visible particles are moving toward the soma but even more invisible material is moving in the other direction. All of these points are emphasized and illustrated with blue grass music. It's not just "music to view axonal movement by" but actually an auditory version of a visual phenomenon. Cold nerves have slow music. Particles can be heard to jump, back up or become stuck and mitochondria sound like a wailing violin. It is the music which makes the facts memorable and stimulates the pleasure centers. My first view was foot tapping delight. When teaching about action potentials and reflexes with chalk board drawings, this film does much to counteract the static view of neurophysiology. It can be used with a lay audience to communicate excitement and beauty in science. It can be used with a graduate or professional audience to convey a specific idea.

N. A. Dahl

- 64 **THE PSYCHOLOGY OF LEFT AND RIGHT**. Carbillis, M. C. and I. L. Beale. Lawrence Erlbaum Associates, Hillsdale, N. J. 1976.

For the concept of left and right to be nontrivial an organism must be approximately bilaterally symmetrical but the ability to distinguish left from right requires some structural asymmetry. This book discusses not just the psychology but the physiology of this problem and provides an excellent review of the literature. It carefully defines the problem as the ability to tell left from right, separate from verbal naming and from turning right in response to a stimulus on the right. The data from animals show that they have difficulty telling right from left. Humans exhibit the same difficulty up to about seven years of age. The book then critically reviews theories which have been advanced to account for the data including psychological perception and neural processing. It discusses the evolution and inheritances of both symmetry and asymmetry and follows how the human child develops the left-right sense. Finally it considers problems arising in left-right confusion, especially in learning to read and in unilateral brain lesions. It is a quite readable book, written to fill in necessary background for the novice in the field. It should be of interest to people investigating learning theory, interhemispheric transfer and hemispheric specialization. It could be useful to the advanced undergraduate students, graduate students and faculty who are interested in a multifaceted approach to a problem of nervous system function.

N. A. Dahl

- 65 STRUCTURE OF THE AUTONOMIC NERVOUS SYSTEM. Gabella, G.S. pp. 1-24. John Wiley & Sons, Inc., New York, 1975.

This monograph provides a concise and well-referenced account of this important system and brings together structure and function in a way that is not generally available in most physiology or anatomy texts. The subject matter includes: (1) ganglia, their development, effects of denervation, comparative aspects of pre-, para-vertebral and intramural; (2) adrenergic axons and nerve terminals; (3) the vagus nerve; (4) autonomic efferents in the CNS; (5) autonomic innervation of specific organs. The text incorporates 24 plates (most of them from the author's laboratory), illustrating the morphology and ultrastructure of ganglia and associated structures as revealed by light and electron microscopy, histochemistry and freeze fracture techniques. This book should appeal to graduate and medical students and to faculty who wish an up-to-date review of this system.

J.M. Marshall

RENAL AND ELECTROLYTE PHYSIOLOGY

- 66 ANTIDIURETIC HORMONE. Hays, R.M. New Eng. J. Med. 295:659-665, 1976.

Particularly valuable for its review of the mechanism of action of antidiuretic hormone. This field has progressed rapidly, and this is the best short review of the topic. Synthesis, transport, secretion, and metabolism are also covered.

A. J. Vander

- 67 ON THE BIOLOGY OF SODIUM EXCRETION: THE SEARCH FOR A NATRIURETIC HORMONE. Bricker, N.S., R.W. Schmidt, H. Favre, L. Fine, and J.J. Bourgoignie. Yale J. Biol. Med. 48: 293-303, 1975.

This review article summarizes evidence for a natriuretic hormone or factor which has been accumulated by the authors since 1968. The article explains why a natriuretic hormone might be expected to be present at high levels in animals or man with advanced stages of chronic renal disease. It goes on to describe representative results from experiments in which gel filtration was used to isolate the factor and activity was quantitated with various bioassays. The bioassay systems have improved in specificity and sophistication, and include kidney cortex slice, isolated frog skin, toad urinary bladder, rat kidney, and isolated perfused rabbit cortical collecting tubule. The factor has been identified in serum and urine from chronically uremic patients and dogs, and in the urine of normal dogs on a high salt diet. The factor is effective only when present on the blood side of the tubules, and specifically inhibits active sodium transport. The chemical nature and source of the factor are uncertain; it may be a peptide. Purification of this factor will permit further studies of its cellular mode of action, and evaluation of its quantitative importance in controlling sodium excretion. This article is recommended for medical and graduate students, physicians, and research workers.

G.A. Tanner

- 68 DISPOSITION AND REGULATION OF BODY POTASSIUM: AN OVERVIEW. Wadi N. Suki. In: American Journal of Medical Sciences, 272:31-41, 1976.

Potassium metabolism, including the renal handling of potassium and factors important in potassium balance, is presented in a clear and balanced fashion. Potassium reabsorption in the proximal tubule and loop of Henle results in delivery of only 5-10% of the filtered potassium to the early distal convoluted tubule. Most of the excreted potassium has been secreted by the end of the distal convoluted tubule and aldosterone increases potassium secretion in this segment. The effects of luminal electronegativity, sodium transport, acid-base balance, and potassium balance itself are discussed in regard to regulation of potassium secretion by the distal nephron. Potassium is also subsequently reabsorbed in the collecting duct and accordingly the collecting duct may participate in the final regulation of potassium excretion. Extrarenal mechanisms for regulation of potassium are also discussed in regard to aldosterone dependency. This is an appropriate teaching aid for medical students and postdoctoral clinical trainees and a gateway to the literature for graduate students and researchers.

F.G. Knox

- 69 ELECTRICAL PHENOMENA IN THE NEPHRON. Boulpaep, E.L. Kidney Internat. 9:88-102, 1976.

A brief survey of the bioelectric properties of the nephron with particular emphasis on relating the overall properties of the epithelium to the properties of the limiting membranes and paracellular shunt pathway. In addition, the way in which these properties affect ion movements across single barriers or through paracellular shunt pathways are discussed. Rather difficult material is covered in a concise and lucid fashion. Ideally suited for graduate students and postdoctoral fellows.

S. G. Schultz

- 70 THE KIDNEY: Volume I. Brenner, B.M., and F.C. Rector Jr. (editors). W.B. Saunders Co., Philadelphia, 1976.

This first volume of a two-volume set is divided into two sections. The first section is concerned with normal renal function and contains chapters dealing with the composition and volume of the body fluids; renal anatomy, metabolism and circulation; glomerular filtration; renal transport of electrolytes; renal acidification and ammonia production; the concentrating and diluting functions of the kidney; renal transport of organic anions; and renal hormones. The second section is concerned with disturbances in the control of body fluid volume and composition and includes sections on metabolic alkalosis and acidosis. The individual chapters were written by internationally recognized leaders in these areas and are of uniformly high caliber, up-to-date and well referenced. The chapters are relatively short and to the point and the volume is admirably suited for students, teachers and investigators in mammalian physiology. It is a valuable addition to any physiologist's library.

S. G. Schultz

- 72 KININS, RENAL FUNCTION, AND BLOOD PRESSURE REGULATION, A SYMPOSIUM. Fed. Proc. 35:175-206, 1976.

Multiple papers dealing with the possible roles of the kinin system in regulating renal hemodynamics, sodium excretion, and arterial blood pressure. The articles tend to be fairly specialized research summaries, but their introductions and discussions provide a vehicle for rapidly reviewing this expanding and potentially important field.

A. J. Vander

- 74 NONOSMOLAR FACTORS AFFECTING RENAL WATER EXCRETION. Schrier, R.W., and T. Berl. New Engl. J. Med. 292: 81-88 and 141-145, 1975.

This review article deals with factors other than the osmotic release of vasopressin (hence, the term "nonosmolar") that affect the rate of renal water excretion. The factors considered are: (1) changes in blood volume, (2) changes in systemic arterial pressure, (3) hormonal factors (catecholamines, prostaglandins, adrenocortical hormones, renin-angiotensin, thyroid hormone), (4) physical and emotional stress, (5) chronic renal failure, (6) metabolic disturbances (hypercalcemia, hypokalemia), (7) sickle-cell disease, and (8) pharmacologic agents. The authors cite the classical observations in this field as well as more recent findings (the bibliography includes 170 references up to 1974). Well established mechanisms are clearly described. How some factors act to change water excretion is, however, uncertain. The authors do not hesitate to deal with controversial issues. The review is helpful in presenting the critical observations which have been made and suggests experiments which ought to be done. The review is of interest to physicians, advanced medical students, and graduate students and faculty in the medical sciences.

G.A. Tanner

- 71 KIDNEY AND URINARY TRACT PHYSIOLOGY. II. Thurau, K. (Ed.) International Review of Physiology, Vol. 11. University Park Press, Baltimore, 1976.

This extremely useful multi-authored volume is a collection of reviews of selected topics on renal physiology: The renal vasculature; Renal blood flow; Renal prostaglandins in relation to sodium regulation, renal blood flow, and hypertension; Renin-angiotensin system and sodium metabolism; Cellular mechanisms of tubular protein transport; Membrane-molecular aspects of tubular transport; Renal handling of calcium and phosphate; Renal excretion of purine metabolites, urate and allantoin; Ammonia production and excretion. Many of these subjects have not been reviewed elsewhere in the past year and most of the reviews should be useful both to the specialist and the generalist.

A. J. Vander

- 73 LOCALIZATION AND FUNCTION OF NA-K-ATPASE ACTIVITY IN VARIOUS STRUCTURES OF THE NEPHRON. Schmidt, U. and H.A. Habicht. In: Membranes and Disease, Ed. L. Bolis, J.I. Hoffman, and A. Leaf. pp. 311-329, Raven, New York, 1976.

This article describes the distribution of Na-K-ATPase activity throughout the renal tubular nephron and relates it to active Na^+ transport. The authors present evidence that an increase in the filtered load of Na^+ may not be the necessary stimulus for activating Na-K-ATPase in the nephron. Utilizing sensitive methods of assay, the activity of Na-K-ATPase was highest in the thick ascending limb of Henle's loop and least in the proximal tubule. In both proximal and distal tubular cells, the enzyme is localized in the basal infoldings. Their results indicate that the activity of Na-K-ATPase changes in parallel and Na^+ transport as effected by aldosterone, and other substances. The authors hypothesize a new mechanism of action for aldosterone. The increase in Na^+ transport induced by aldosterone is thought to be caused by the production of a protein which regulates the amount of catalytic sites of Na-K-ATPase which are always present in the distal tubular cell. Subsequent to the activation of these sites is an increase in rate of Na^+ reabsorption. This article should be of interest to faculty, graduate and medical students interested in developing an understanding of the mechanisms responsible for renal tubular transport of Na^+ and its control.

H.M. Randall

- 75 NONOSMOLAR FACTORS AFFECTING RENAL WATER EXCRETION. Schrier, R.W., and T. Berl. New Eng. J. Med. 292:81-88, 141-145, 1975.

A succinct review of the many factors other than osmolarity which alter renal water excretion. These are: changes in blood volume or systemic arterial pressure (reflexes initiated by "volume" or "baroreceptors"); hormonal factors; physical and emotional stress; metabolic disturbances; disease states; and pharmacological agents. This review will be valuable for both basic scientists and clinicians.

A. J. Vander

- 76 PROXIMAL SODIUM AND FLUID TRANSPORT. Windhager, E.E. and G. Giebisch. Kidney Internat. 9:121-133, 1976.

A concise up-to-date review of some of the fundamental aspects of renal proximal tubular electrolyte and water transport, including a discussion of the role of chloride concentration gradients, bicarbonate, organic solutes and peritubular factors. The review is well written and of value to students, teachers and investigators alike.

S. G. Schultz

- 78 RENAL BLOOD FLOW. K. Aukland. In: MTP International Review of Physiology, Vol 11: Kidney and Urinary Tract Physiology, pp. 23-79. Ed. Klaus Thurau, University Park Press, Baltimore, Md. 1976.

This chapter presents a relatively comprehensive review of current knowledge regarding renal blood flow. The author's personal research interests are readily apparent and a critical assessment, including methodological aspects, of intrarenal blood flow distribution patterns is included. Potential technical and methodological pitfalls and how they may affect interpretation of previous studies are noted. The author provides a systematic coverage of 1) the effects of renal nerves and catecholamines on renal hemodynamics, 2) the influence of certain hormonal systems, renin-angiotensin, prostaglandins, and vasopressin, on renal hemodynamics, 3) the autoregulatory phenomenon, and 4) renal blood flow responses to certain physiological and experimental conditions. Overall, the coverage is well balanced and objective. The inclusion of concluding remarks at the end of each section is also particularly helpful in providing a very brief overview. The discussion concerning the mechanism and significance of renal autoregulation, while fairly comprehensive, suffers from a lack of detailed analysis of the validity of the evidence which has been presented in support of the various proposals. Overall, the article should be helpful to physiologists and advanced students wishing to obtain detailed information on renal hemodynamics. The bibliography, while not exhaustive, is very extensive.

L. G. Navar

- 80 RENAL PHYSIOLOGY: PRINCIPLES AND FUNCTIONS. Koushanpour, Esmail. W. B. Saunders Company, Philadelphia, PA. 1976. 581 pages.

This book is "an attempt to present an integrated, quantitative analysis of renal function and its role in body fluid homeostasis". The textbook is designed primarily for medical and graduate students, physicians interested in renal physiology, and others in allied health professions. The format consists of several introductory chapters giving an overview of the renal-body fluid system, followed by chapters dealing with the mathematical and mechanistic basis of renal physiology, the formation of glomerular ultrafiltrate, the basis of the clearance concept, the biochemical basis of tubular transport, tubular reabsorption and secretion mechanisms, acid base balance, concentration and dilution mechanisms, and regulation of extracellular fluid volume and osmolality. The mathematical treatment of these problems might initially dissuade a student from reading this text, but in fact does not require an extensive background. The teaching value of the book is enhanced by the inclusion of pertinent questions and problems at the end of most chapters. The systems analysis approach lends itself well to an integrated view of renal physiology and its interaction with other organ systems. The chapter on pathophysiology unfortunately contains a number of erroneous statements. Two appendices dealing with a quantitative description of biological control systems and the mathematical basis of the dilution principle are included.

L. G. Navar

- 77 RECENT ADVANCES IN OUR UNDERSTANDING OF THE VITAMIN D ENDOCRINE SYSTEM. H.F. Deluca. J. Lab. Clin. Med. 87:7-26, 1976.

This review of the vitamin D endocrine system is primarily for those who are interested in keeping pace with this rapidly developing field. The author reviews the recent advances in the function of vitamin D, the metabolism of vitamin D, the regulation of vitamin D, and the possible presence of an additional active form of vitamin D. This concise review will make it an excellent teaching supplement to interested medical and graduate students as well as to postgraduates who are interested in a basic discussion of the pivotal role of the kidney in the regulation of vitamin D and in the control of calcium and phosphate metabolism.

E.G. Schenider

- 79 RENAL FUNCTION: MECHANISMS PRESERVING FLUID AND SOLUTE BALANCE IN HEALTH. Valtin, Heinz. Little, Brown and Company, New York, 1973.

Dr. Valtin's text, which presents major topics in renal physiology in a succinct, comprehensive fashion, is most welcome. The book includes 11 chapters, each approximately 15 pages of text. The topics include body fluid components, glomerular filtration, tubular reabsorption, tubular secretory processes, renal hemodynamics and O_2 concentration, Na^+ and H_2O handling, and H^+ and K^+ transport. The text is readable, and the illustrations are excellent. The tabular data are easily understood, and equations which are presented are explained in detail. Each chapter ends with a carefully selected list of references. Clinical problems, answered at the end of the book, are presented at the end of a given chapter, and illustrate clearly the bedside application of renal physiology to the understanding of disease states. Complicated questions are explained tersely and with clarity; for example, current hypotheses on the forces regulating glomerular filtration, and mechanisms for isotonic fluid reabsorption, are each set forth in less than 5 pages of easily understood text. I have few criticisms. The particular functional characteristic of various nephron segments might have been presented in more detail. And descriptions of the renin-angiotensin axis and the physiology and pharmacology of diuretic agents are limited. These are carping comments on an excellent book for beginning students of renal physiology. At the listed prices, it is a bargain.

T. E. Andreoli

- 81 RENAL PHYSIOLOGY: PRINCIPLES AND FUNCTIONS. E. Koushanpour. W.B. Saunders Co., 581 pp. Philadelphia, 1976.

This book offers a comprehensive introduction to renal physiology and to the variety of systems which interact with the kidney. The author makes use of both mathematics and systems analysis in the description of the classical aspects of renal function. In addition, the author also presents a detailed discussion of the body fluid compartments and the regulation of extracellular volume and osmolality. At the end of each chapter is a problem set to help the student to evaluate his understanding of the major points of each topic. Although the length of the book may make it difficult to use in compressed curriculum, medical students, graduate students, and postgraduate students will find this an excellent comprehensive introduction to renal function.

E.G. Schneider

- 82 RENAL PROSTAGLANDINS. Zins, G.R. Amer. J. Med. 58:14-24, 1975.

An excellent brief review of the synthesis and metabolism of renal prostaglandins, and of their hypothesized functions in regulating renal blood flow, salt and water excretion, and arterial blood pressure. Easily understood by the non-expert.

A. J. Vander

- 83 RENAL URATE EXCRETION IN ANIMAL MODELS. Weiner, I.M., and G.M. Fanelli, Jr. Nephron 14:33-47, 1975.

The comparative physiology and pharmacology of renal urate handling are considered with special attention to bidirectional transport, intrarenal urate synthesis and degradation, nature and sites of transport processes. A readable review of an extremely complex subject.

A. J. Vander

- 84 SOME ASPECTS OF DISTAL TUBULAR SOLUTE AND WATER TRANSPORT. Hierholzer, K. and M. Wiederholt. In: Kidney International 9:198-213, 1976.

This review examines the more significant mechanisms responsible for modifying the glomerular filtrate in: the thick ascending limb of Henle's loop, the macula densa, the distal convoluted tubule, and the collecting duct. In each segment of the nephron, the precise mechanisms responsible for the handling of Na^+ , Cl^- , K^+ and water are discussed. In addition, the authors discuss how these mechanisms can be varied, such as by changing the luminal environment, including: increasing the rate of volume flow as induced by diuretics, and altering luminal $[\text{Na}^+]$, $[\text{K}^+]$, or $[\text{H}^+]$. Likewise, the effects of glucocorticoids, mineralocorticoids, and ADH, whose plasma concentrations are altered by the effects of salt or water deprivation or excess, are discussed in terms of their locus of action and the means by which they alter the tubular handling of ions and water. This review should be of particular value to faculty, graduate students and sophisticated medical students who desire an understanding of the functional complexities of the nephron, distal to the proximal tubule, whose significance is to finely adjust the solute and water levels of the body consistent with homeostatic demands.

H.M. Randall

- 85 SOME ASPECTS OF DISTAL TUBULAR SOLUTE AND WATER TRANSPORT. Hierholzer, K. and M. Wiederholt. Kidney Internat. 9:198-213, 1976.

An up-to-date review of electrolyte and water transport by the distal nephron including a discussion of the effects of mineralocorticoids and anti-diuretic hormone. The treatment is brief, well referenced and informative.

S. G. Schultz

- 86 TRANSPORT OF MOLECULES ACROSS RENAL GLOMERULAR CAPILLARIES. Brenner, B.M., C. Baylis, and W.M. Deen. Physiol. Rev. 56:502-534, 1976.

This is a review of the factors responsible for the control of glomerular filtration, and those factors responsible for transport of macromolecules across glomerular capillaries. The review examines the variables of glomerular filtration, measured primarily in the Munich-Wistar rat, including: ultrafiltration coefficient, glomerular capillary and proximal tubular hydraulic pressures, and the afferent and efferent arteriolar colloid osmotic pressures. To ascertain the mechanism responsible for regulating glomerular filtration, the above variables have been measured directly during: normal physiological conditions, varying arterial pressures, the influence of a variety of vasodilator and vasoconstrictor substances and primary glomerular injury. In the Wistar rat, the rate of glomerular ultrafiltration has been found to be largely dependent on the rate of glomerular plasma flow. Those factors responsible for the transport of macromolecules across the glomerular capillaries have been discussed including: molecular weight, glomerular filtration rate, and molecular charge. A negatively charged component of the glomerular capillary wall has been proposed as being responsible for the restricted filtration of albumin. The authors suggest that the loss of this charge in glomerular injury may explain the proteinuria observed in such injuries. This review should be of particular value to graduate students, medical students and faculty who wish to develop an understanding of those mechanisms which underly the regulation of glomerular filtration and the filtration of macromolecules in health and disease. H.M. Randall

- 87 TRANSPORT OF MOLECULES ACROSS RENAL GLOMERULAR CAPILLARIES. Brenner, B.M., C. Baylis, and W.M. Deen. Physiol. Rev. 56: 502-534, 1976.

This excellent review covers recent advances in our understanding of the process of glomerular filtration. The major topics covered are (1) determinants of glomerular filtration rate (GFR), and (2) transglomerular transport of macromolecules. The filtration pressure equilibrium concept and its implications are discussed. The dependence of GFR on plasma flow is illustrated. Recent experiments with vasoactive drugs are summarized. The factors which influence fractional clearance of macromolecules are discussed. These factors are (1) molecular size, (2) GFR, and (3) molecular charge. The anionic nature of dextran sulfate or serum albumin impedes passage of these macromolecules across the glomerular capillary wall. A loss of fixed negative charges in the glomerular capillary wall may account for the proteinuria in glomerulonephritis. For a different viewpoint on determinants of GFR, I recommend: (1) Kallskog, Lindbom, Ulfendahl, and Wolgast. Acta physiol. scand. 95: 191-200 and 293-300, 1975, and (2) Ott, Marchand, Diaz-Buxo, and Knox. Am. J. Physiol. 231: 235-239, 1976. This review is particularly appropriate as a discussion topic for graduate students.

G.A. Tanner

- 88 TRANSPORT PROCESSES IN URINARY ACIDIFICATION. Malnic, G., and P.R. Steinmetz. *Kidney Intern.* 9:172-188, 1976.

A comprehensive review of the processes which underly the reabsorption of bicarbonate and excretion of acid by the kidneys. The subjects reviewed include the nature of the transported ion species in acidification, the question of whether or not H^+ secretion is coupled directly to the transport of Na^+ and other electrolytes, the behavior of active and passive components of transport during acidification against an electrochemical gradient, and the factors that are rate-determining for each of the transport processes. It should serve as a difficult but excellent review of the subject.

A. J. Vander

- 90 THE URINARY CONCENTRATING MECHANISM. Jamison, R.L., and R.H. Maffly. *New Eng. J. Med.* 295:1059-1067, 1976.

This area is extremely difficult to teach, at least in part because of multiple unsettled questions concerning the basic functioning of the countercurrent system. This review admirably presents the contemporary theories and emphasizes critical points, including the possible role of urea. It is also valuable for its section on pathophysiology of the renal concentrating mechanism.

A. J. Vander

- 89 TUBULAR ORGANIZATION AND VASCULO-TUBULAR RELATIONS IN THE DOG KIDNEY. Beeuwkes, R., and J.V. Bonventre. *Amer. J. Physiol.* 229:695-713, 1975.

An essential article for updating one's view of the renal circulation. Beautiful new synoptic diagrams of canine renal organization are presented.

A. J. Vander

- 91 WATER METABOLISM. R. Schrier (guest editor). *Kidney Internat.* 10:1-132, 1976.

This symposium brings together 10 laboratories which are working on the broad spectrum of problems related to water metabolism. The reader is able to obtain an overview of physiological, biochemical, pharmacological and clinical problems presently thought to be important in understanding the physiology and pathophysiology of water metabolism. The subject matter presented includes: 1) thirst, 2) secretion and control of ADH release, 3) renal water metabolism, 4) pharmacology of water metabolism, and 5) clinical aspects of water metabolism. This symposium will be particularly valuable to graduate students, advanced medical students and faculty who are interested in water metabolism and homeostatic control of plasma and extracellular volume.

E.G. Schneider

- 92 SYMPOSIUM ON WATER METABOLISM. R.W. Schrier, Editor. *Kidney International* 10: 1-132, 1976.

This special issue of *Kidney International* consists of ten review articles on water metabolism by experts in this field. The topics covered are: (1) physiological basis of thirst, (2) hypothalamic neurons secreting vasopressin and neurophysin, (3) osmoregulation of vasopressin release, (4) hormones other than vasopressin which influence water excretion, (5) cellular actions of vasopressin in the mammalian kidney, (6) water movement across nephron segments involved with the countercurrent multiplication system, (7) drug-induced states of nephrogenic diabetes insipidus, (8) drug-induced states of impaired water excretion, (9) effect of hypernatremic and hyponatremic states on the central nervous system, and (10) clinical disorders of water metabolism. Most of the reviews are concerned with what is known about basic mechanisms. The applicability of this knowledge to understanding clinical situations is repeatedly illustrated. The contributions at the end of the symposium have a clinical emphasis. The articles are up-to-date and quite comprehensive. Graduate students, medical students, physicians, and research workers will find a wealth of valuable information in this symposium.

G.A. Tanner

RESPIRATION

- 93 THE BIOCHEMICAL BASIS OF PULMONARY FUNCTION. Crystal, Ronald G. (Editor). Marcel Dekker, New York, 1976.

For the pulmonary physiologist, the distinction between the biochemistry and physiology of the lung is becoming increasingly blurred. For example, in whose domain is the production of surfactant which plays an essential role in maintaining lung stability? This volume therefore is a valuable resource for the physiologist who needs information on (a) the cells of the lung and their organelles, (b) the basic metabolic functions of the lung including energy production and carbohydrate, lipid, and protein metabolism, (c) the connective tissue of the lung including collagen, elastin and the proteases, and (d) the surfactant system. The monograph will be particularly valuable for graduate students, postdoctoral trainees, and their teachers who want an up-to-date review of these rapidly changing areas.

John B. West

- 95 PULMONARY PHYSIOLOGY OF THE FETUS NEWBORN AND CHILD. E.M. SCARPELLI (ed.). Lea and Febiger, Philadelphia, 1975, 369 pages.

As stated by the editor, the aim of this ambitious, multi-authored book is to provide an overview of "...fetal, transitional, adaptive and developmental physiology and, within these areas...the interplay of morphology, cell biology, biochemistry, pharmacology, immunology and classic physiology." Nine of the fifteen chapters are principally concerned with the physiology of respiration at various developmental stages; the other chapters deal with a variety of non-respiratory topics, including lipid biochemistry, lung defense mechanisms and pulmonary fluid balance and immunology. The general quality of the individual contributions is good, and careful editing provides useful cross-referencing among them. Original sources are cited more often than in most textbooks, and the references are remarkably up to date, some having been published in the same year as the book itself. This volume is useful both for students of developmental physiology and for those seeking an understanding of normal function as a background for the study of perinatal and pediatric lung diseases.

D. Bartlett, Jr.

- 97 THE UPPER AIRWAYS. PART I. NASAL PHYSIOLOGY AND DEFENSE OF THE LUNGS. AND PART II. THE LARYNX AND TRACHEA. Proctor, D. F. Am. Rev. Resp. Dis., 115: 97-129, and 315-342, 1977.

This reviewer is not aware of a better summary of the anatomy and physiology of the nose, larynx and trachea than these papers. Regrettably, in spite of an importance obvious to laymen, the functions of the upper airways are frequently overlooked by students of respiratory physiology. The nose provides an adaptable low-resistance chamber in which adjustments are made to the temperature, humidity and foreign material content of air; the larynx has capabilities for exclusion or expulsion of undesirable materials and for phonation, while the trachea provides a collapsible low-resistance airway with properties important for effective cough. All have important roles in mucociliary transport and in generation of several reflexes. These reviews first cover pertinent anatomy before describing normal physiology, and then proceed to consider malfunctions. Sections are clearly delineated, allowing exclusion of specific subtopics or acquisition of normal physiology independent of its clinical extension. In addition to many references, the author draws upon his own considerable experience and expertise to present his topic. This material is suitable for graduate physiology students and undergraduate medical students, and in the case of students of respiratory physiology, should probably be made mandatory reading.

T. C. Lloyd, Jr.

- 94 MORPHOLOGY AND MECHANISMS OF CHEMORECEPTORS. Edited by A. S. Paintal, Pp. 1-357 Vallabhobha Dattel Chest Institute, Delhi, 1976.

This is the proceedings of an International Satellite Symposium held in Srinagar, Dashmir, India, 1974. A total of 36 papers are collected and presented in seven sections, including (1) structure and responses of the receptor, (2) local PO_2 and metabolism within the carotid body, (3) mechanisms and hypothesis on chemoreception, (4) the overall reflex effect on ventilation in animals and man, (5) efferent control of chemoreceptors, (6) central mechanisms involved in the chemoreceptor reflex, (7) comparative physiology of the chemoreceptor, and (8) effects of carbon monoxide on chemoreceptor. Like any other symposium proceedings, the topics collected in this book cover the important aspects of chemoreceptor reflex reasonably well but not completely. The emphasis is on the cellular mechanism of chemoreception and the overall reflex effects on ventilation. Slightly disappointing is that there is no subsection in which the chemoreceptor reflex effect on circulation and/or the interaction with the baroreceptor reflex is explicitly discussed. There are several review papers which put the past and recent knowledge and theories against appropriate perspectives, and these will be helpful to those who attempt to catch up in the field. For those who are already in the field, the documented discussions by the participants after each paper are most enlightening and enjoyable. The book is recommendable as a reference for advanced teaching in respiratory physiology.

K. Sagawa

- 96 PULMONARY AND RESPIRATORY PHYSIOLOGY. Comroe, Julius H. Jr., (ed.). 2 vols. Dowden, Hutchinson and Ross, Stroudsburg, Pa., 1976.

These two volumes are parts 5 and 6 of a series of Benchmark Papers in Human Physiology. The general aim of the series is to provide a selection of key papers in the development of particular area of physiology in an easily accessible form. The present volumes cover respiratory physiology from the discovery of carbon dioxide and oxygen in the 17th and 18th centuries to research on the effects of organic phosphates on the oxygen dissociation curve in 1967. Editors comments precede each group of papers and are helpful in putting them in their historical setting. In all, 114 papers are included though many are reproduced only as excerpts, sometimes just a page or two. These however whet the appetite for further reading. The editor has rather boldly included a number of papers from the 1950's and 60's which will naturally please those readers who have had papers included more than those who have not. The volumes will be especially valuable to faculty and graduate students who wish to become better acquainted with the historical background of a particular area. Inquisitive medical students who develop a special interest in respiration will also enjoy these stimulating volumes.

J.B. West

- 98 THE UPPER AIRWAYS. Proctor, Donald F. Amer. Rev. Resp. Dis. 115: 97-129, and 315-342, 1977.

This useful review is in two parts: (1) nasal physiology and defense of the lungs, and (2) the larynx and trachea. The main topics covered are: (a) functional anatomy of the nose, larynx and trachea, (b) physiological aspects including mode of airflow, flow resistance, mucociliary function, warming and humidification of inspired gas, particle deposition and gas absorption, effects of air pollution, phonation, and laryngotracheal reflexes, and (c) changes which occur in disease including the effects of nasal, laryngeal and tracheal obstruction, and sleep-related apnea. Over 600 papers are cited in the text. The review extends beyond the traditional borders of respiratory physiology but it will be valuable to graduate students, postdoctoral fellows and faculty who need current information on this important and somewhat neglected area.

John B. West

- 99 THE UPPER AIRWAYS. Proctor, D.F. Amer. Rev. Resp. Dis. 115: 97-129 and 315-342, 1977.

This authoritative, well-written review is published in two sections, the first on nasal physiology and the second on the larynx and trachea. In each section the author deals first with normal form and function and then presents a brief discussion of alterations of function in disease. Both classical disease processes and the effects of environmental factors are considered. The clarity of the text and the extensive bibliography make this a very useful review for those concerned with either normal or pathological physiology of the upper airways.

D. Bartlett, Jr.