recovery had been given up. Several very impressive cures were obtained with malignant as well as benign tumors. A major problem in the destruction of the tumors is the overloading of the excretory system with toxic decomposition products that may cause death by poisoning. Also, the destruction and resolving of stomach and intestinal tumors may cause perforations. It is of interest that strongly irradiated tissue is resolved in the same manner as tumor tissue.

The general importance of these systems and of their magnitude and rate of change is further demonstrated by cures of dermatoses, such as lupus vulgaris, skin tuberculosis, and psoriasis in human beings, and Walker carcinoma in rats. Reference is made to the cooperative work on dermatoses with the late Dr. Bering. The scope of the book may be gaged from the following Table of Contents:

I. *Introduction* (22 pages): "The blood systems," "Blood lipid and blood sugar," "The cholesterol-phosphatide system," "The cholesterol-sugar-phosphatide system"
II. *The Pathology of Blood Reactions* (7 pages)
III. *Blood Reactions and Proliferative Phenomena* (52 pages): "Hormones," "Proteins-glucose-salt solutions," "Additional supply of phosphatides and glucose," "Solutions of salt mixtures," "Summary"
IV. *System Reactions and Proliferative Phenomena* (15 pages)
V. *Destruction of Tumors* (34 pages)
VI. *The Significance of the Relationship between Blood Sugar and Cholesterol Esters* (13 pages)
VII. *The Time Factor* (5 pages)
VIII. *Benign Tumors and Dermatoses* (16 pages): "Dermatoses," "The Walker carcinoma"
IX. *Theoretical Basis and Methodology of a Therapy* (9 pages)
X. *Blood Reactions and Tumors* (25 pages)

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The Cultivation of Animal and Plant Cells. Philip R. White. Ronald Press, New York, 1954. xi + 239 pp. Illus. $6.

Very few persons have had the necessary experience in the cultivation of both animal and plant cells to be able to write a book like this one. One's first reaction to the title might be to question how many readers would be broad enough in their interests to appreciate a book encompassing both of these fields. However, the author has interwoven the plant and animal material so skillfully that upon reading the book it seems quite natural to consider them as two facets of the same fundamental problem. The reader whose own work is concerned with animal cells is not likely to skip over the passages on plants, but he may very well read these passages with even more interest and profit than those sections dealing with material more familiar to him.

At the outset, a short chapter focuses attention on the primary importance of the cell as the basic physiological unit that must be understood before one can study effectively the complex integrated systems of the units that comprise the organism as a whole. This is followed by an excellent historical account of the development of cell culture, illustrated with portraits of 12 of the leading contributors to the field. Succeeding chapters are concerned with the living material for cell cultures, the laboratory and its equipment, nutrients, and the various types of cultures. One chapter is devoted to a detailed and lucid exposition of the procedures for isolating a tissue and setting up cultures. This exposition is amplified by convenient lists of the materials required, and it is illustrated by several helpful diagrams. The two final chapters deal with methods for the measurement of growth and the applications of cell culture.

Many persons have been discouraged from undertaking cell culture because of the widespread belief that it involves complex techniques and elaborate, expensive equipment. One of White's stated objectives is to dispel this misapprehension and to encourage the belief that the principles and methods of cell cultivation are relatively simple and that much of the equipment required is already at hand in most modern laboratories. In this worthy objective he succeeds very well. A novel and valuable feature of the book is its appendix, entitled "Simple techniques for beginners," which presents a number of exercises suitable for class use in a course in cell culture or even in an undergraduate course in biology.

This admirably organized, well-written book will be welcomed by novices in the field of cell culture and by teachers, as well as by established investigators.

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Communication Theory. Papers read at a symposium on application of communication theory held at the Institution of Electrical Engineers, London, 22–26 Sept. 1952. Willis Jackson, Ed. Academic Press, New York; Butterworths, London, 1953. 532 pp. Illus. $11.

Modern developments in communication theory are proliferating at a prodigious rate, and although they have not brought about the major revolutions envisioned a few years back by some of their more enthusiastic adherents, there is no doubt that they are significant and that they will permeate many fields and be useful, both practically and theoretically. The present volume is a collection of 38 papers read at a symposium on communication theory in London in Sept. 1952. They exemplify both the impact on the communication field and the fructifying effects in other fields resulting from the new developments.

The first 25 papers (360 pp.) comprise a summary of communication theory, a group of nine papers on transmission systems and coding, eight grouped around the general theme of discrimination of signals in the presence of noise, four on divers characteristics of transmission channels, and three on applications to television. The rest range over many fields; one deals

with the theory of hearing; three with information-theoretic aspects of spoken speech, two with mechanical recognition of spoken sounds; others deal with the behavior of telephone users as affected by circuit properties, the communication rate of a speech link, and speech synthesis; the concluding heterogeneous group of four papers is labeled "associated studies." These four are devoted to an application of information theory to optics, an information theory of the statistical structure of language, an attack on the problem of semantic information (as distinguished from the engineering problem of transmission of choices from a sequence of alternative symbols with no account taken of possible "meanings"), and a discussion of information generators, that is, machines from which "meaningful" information, rather than messages made by a monkey with a typewriter (noise in a semantic but not in an engineering sense), can come.

The contributors are important workers in their fields, the quality of presentation is generally excellent, and the level of discussion is advanced. Many trees in the forest of communication theory are examined, and the discussions after each paper are often quite illuminating. The international flavor of the symposium is another indication of the current vitality of the field, with Great Britain, the United States, Holland, Germany, France, Sweden, Switzerland, Israel, and Poland-in-exile represented among the contributors. The specialist will find the book a useful reference.

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Energy Metabolism and Nutrition. Raymond W. Swift and Cyrus E. French. Scarecrow Press, Washington, D.C., 1954. 264 pp. Illus. $5.75.

The stated objective of this book is

> . . . to bring together various methods of direct and indirect calorimetry and to point out the applicability of each in modern nutrition science. . . . It is the hope of the authors that mature but relatively inexperienced students in biochemistry and physiology . . . may find this book of value as a guide in forming a coherent understanding of theory and practice.

The typical problems in the appendix are extremely valuable in presenting the principles and practices of energy metabolism to the student of nutrition, physiology, and biochemistry at the senior and graduate levels. The footnote references with full titles in the original languages, which range over nearly two centuries, give the book a time dimension. However, the authors missed a grand opportunity by not presenting their investigations in a historical framework for the following reasons.

The authors are senior members of the recently organized Department of Animal Nutrition, The Pennsylvania State University. This department is successor to the famous Institute of Animal Nutrition, Pennsylvania State College, that was organized at the turn of the century by Henry Prentiss Armsby (1853–1921), the ablest American investigator of farm-animal nutrition, particularly that of cattle, during the previtamin era. In 1898 the U.S. Department of Agriculture provided Armsby with funds to build an Atwater-Rosa type respiration calorimeter for cattle. Use of the resulting calorimeter began in 1901 and continued until Armsby's death. The researches of the Armsby group on the net energy values of cattle feeds and on many related problems of the greatest interest will forever remain one of the most brilliant chapters in the history of cattle (ruminant) nutrition. Unfortunately, only scattered references are casually given to Armsby's epochal contributions.

E. B. Forbes, Armsby's successor as director of the institute, gradually shifted from the use of this respiration *calorimeter* to the use of the respiration *chamber,* of which there were already several in use; and later the Forbes group drifted from cattle to rat calorimetry. This work on rats is being continued by the authors of this book. The effect of plane and composition of diet on its productive energy as determined on rats is of great interest. It is, however, a pity that the only direct respiration calorimeter for cattle in the world is not being utilized for solving problems that cannot otherwise be solved. For instance, nothing is known about the amount of heat produced in the rumen by anaerobic fermentation, and how this heat production is influenced by the nature and amount of feed supply, breed and species, and environmental temperature. This rumen heat production could be estimated by taking the difference between the heat produced by direct calorimetry and that produced by indirect (O_2 consumption) calorimetry.

The major value of this book, then, consists in bringing together the research methods and aims of three successive research groups—Armsby *et al.,* Forbes *et al.,* and the authors—at the same institution although of a different name. The major defect is the failure to give the student a historical perspective to a massive landmark in the history of nutrition research in this country. Institutions, departments, and research projects, like individual men and women, have fascinating histories with triumphs and tragedies. The scheduled appearance of a biography of Armsby by the senior author in the Sept. (1954) issue of the *Journal of Nutrition* does not justify this historical omission in a book designed for senior and graduate students who are in particular need of historical orientation and broad perspectives.

The other parts of the book furnish condensed reviews of the scattered literature on nutrition and related subjects, including acid-base balance; endocrine secretions; muscular activity; work efficiency; basal metabolism and surface area; undernutrition, obesity, and energy metabolism; metabolism of diabetes; and so on.

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