Book Reviews

The Structure and Function of Skin. William Montagna. Academic Press, New York, 1956. 356 pp. Illus. $8.80.

In a relatively few, beautifully illustrated pages, William Montagna systematically describes the microscopic, submicroscopic, and histochemical anatomy of the many structures in the most extensive and multipotent organ in the body —the skin. This book presents an unusual three-dimensional view of the structure, and adds a fourth dimension of function, of the cutaneous system. A blending of biological and physiological information with detail on anatomy keeps the monograph from being merely a dry, reference volume.

The author's common-sense approach to the problem of excess terminology is seen in his proposal to retain the term *melanoblast* for both the immature and the more mature types of pigment-forming cells. He presents an unusually lucid comparison of melanoblasts and clear cells of Langerhans.

There is also a keen analysis of the secretion granules in apocrine sweat glands, in which the author questions the acceptance of this phenomenon as the sole index of secretory activity.

The text includes an excellent chapter on the terminology and architecture of the hair follicle and an analysis of its pattern of growth. Montagna emphasizes that it is still not known whether increase in vascularity of the follicular capillary system is a stimulus that causes resting follicles to become active or whether it is a response to a stimulus that originates within the follicle.

The author points out that, while seborrhea usually accompanies acne vulgaris, the sebaceous gland is only one of the elements of the cutaneous system and that the latter functions as a unit. The pathogenesis of acne may, therefore, involve dysfunction of the entire skin rather than overactivity of only one component.

Montagna, whose investigative acumen I appreciated when I functioned as executive secretary of the National Research Council's advisory group in the field of dermatology, is a member of the Subcommittee on the Cutaneous System of the National Academy of Sciences–National Research Council and has made important contributions to knowledge of the functional anatomy of the skin and its appendages. In Chapter VIII, entitled "Reflections," the author modestly puts his own philosophic interpretations last. I recommend that these be read upon beginning the volume; they are very worth while and add to the enjoyment of the text.

The book will be found highly interesting, not only by anatomists, histologists, and dermatologists, but also by pathologists, physiologists, biochemists, research workers, and all who are intrigued by the basic science of medicine.

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Pilot Plant Techniques of Submerged Fermentation. Special English edition of *Rendiconti Istituto Superiore di Sanita,* vol. 17. Fondazione Emanuele Paterno Viale Regina Elena, Rome, 1954 (distributed by Interscience, New York). x + 243 pp. Illus. Paper, $8.10.

This book is the first of a series of English editions of the *Journal of the Istituto Superiore Di Sanita* of Rome. It consists of papers originally published in Italian and covers much of the work on submerged fermentation equipment and techniques carried out in the International Research Center for Chemical Microbiology under the direction of E. B. Chain.

The first paper is a continuation of the excellent and complete studies of oxygen transfer which have been made under Chain's direction. The paper includes aeration studies in shake flasks, 10-liter, 50-liter, 130-liter, 200-liter, and 12,000-liter fermentors. In addition to the usual sulfite method for determination of oxygen transfer, a method using the rotating platinum electrode is described.

About one-half of the book is devoted to papers describing the design and operation of the equipment used at the institute for the submerged culture of aerobic organisms. This portion of the book will be of interest primarily to engineers and persons in charge of pilot-plant and production equipment. Such persons will benefit greatly from reading these chapters. This series of papers is written and illustrated in such detail that it should be possible for one completely unskilled in the operation of a submerged fermentation pilot plant to reproduce and operate such a pilot plant. Several new and novel techniques are included—for example, the bottom entering "compensated" stuffing box in which a portion of the stuffing box is completely submerged in the fermenting medium.

Several unsafe acts, at least by American standards, are described. It would be unthinkable in the United States to apply 0.5 atmosphere to an ordinary round-bottom flask, even though the flask is "wrapped in a towel to protect the operator against the danger of an explosion. . . ."

In addition to the aforementioned papers, two others are included in this section; one is a paper describing a rotary shaker suspended on steel balls, and the other is a study of methods used for the evaluation of antifoam preparations.

The paper on the study of the effect of mechanical agitation on the morphology of *Penicillium chrysogenum* is excellent; although it is near the end of the book, it should be read in conjunction with the paper on aeration. Two papers on heterokaryosis in *Penicillium chrysogenum,* a study of the interrelation of protein and polynucleotide synthesis in *Escherichia coli,* and a description of a new genus of soil fungus, *Romanoa,* are included

The book is paper bound and is rather fragile. The fairly large number of typographic errors do not significantly detract from its readability. This book should prove to be of interest and benefit to anyone interested in the subject of submerged fermentation, whether in research, production, or engineering. It is hoped that the other English editions of the journal of the institute will be forthcoming as planned.

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Gestation. Transactions of the second conference 8–10 Mar. 1955, Princeton, N.J. Claude A. Villee, Ed. Josiah Macy, Jr., Foundation, New York, 1956. 262 pp. 116 illus. $5.

The second conference on gestation was attended by 12 member participants and nine guests. Seven papers were presented as follows: "Self-regulatory functions during gestation and lactation" by Curt P. Richter, "Social reactions of

pregnant and lactating rats" by Pierre C. Karli, "Delayed implantation in mammals" by Robert K. Enders, "Morphology and physiology of the uteroplacental circulation" by James Dixon Boyd, "Uteroplacental circulation in mammals" by C. Sidney Burwell, "Pressures in the fetal circulatory system of the sheep" by S. R. M. Reynolds, "Distribution of arteries and veins in the mammalian placenta" by Elizabeth M. Ramsey.

These conferences are especially interesting, because there are interruptions throughout each presentation. Furthermore, the discussions are spirited, provocative and frank. As Fremont-Smith says, "the tradition, now well established, that authority carries little weight in evaluating the credibility of ideas, concepts, and data, help to make the conference a forum for searching examination of differences of opinion and of the reasons for contradictory experimental results. Overgeneralizations are quickly met with the question 'with respect to what?' "

The discussion of Boyd's paper concerning the uteroplacental circulation was particularly interesting to me, but it is unfair to select any of the papers presented as being more worthwhile than the rest.

The book is a very important contribution on the subject of gestation. It is up-to-date and contains a vast amount of valuable information presented by experts in anatomy, biological chemistry, physiology, cancer, biology, psychobiology, zoology, embryology, and obstetrics and gynecology. It is a pleasure to read the book, not only for its stimulating contents, but also because the type is clear and the illustrations are well reproduced.

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Expanding Universes. E. Schrödinger. Cambridge University Press, Cambridge, 1956. 93 pp. 10 illus. $3.50.

This lucid series of lectures is concerned with the kinematics of particles and waves in an expanding universe. The first two chapters present an interesting exposition of the geometric properties of the de Sitter universe and general spherical spaces. Various representations of the de Sitter universe are compared. Properties of the geodesics and null geodesics and the meaning of the red shift of light waves are discussed. The other two chapters deal with a question that led historically to the development of wave mechanics—that is, the relationship between geometric optics, wave optics, and the Hamilton-Jacobi equation. The propagation of waves in an expanding universe and the concept of paths along geodesics are examined. The discussion follows largely some research work of the author that was published in the 1930's.

The book is distinguished throughout by its delightful clarity, its constant emphasis on geometric visualization and its unhurried style. This forms a pleasant contrast to the modern tendency of piling formalism on formalism, and one cannot help wondering whether our contact with physical intuition is not seriously obstructed by the modern trend in the style of writing.

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Engineering in History. Richard S. Kirby, Sidney Withington, Arthur B. Darling, and Frederick G. Kilgour. McGraw-Hill, New York, 1956. vii + 530 pp. Illus. $8.50.

History of American Technology. John W. Oliver. Ronald Press, New York, 1956. $6.50.

The stimulating history of engineering by Richard S. Kirby and his associates emphasizes at all times the close contacts between science and engineering. The initiation of novelty emerges, at times, in some practical application for which scientific analysis finally affords a generalized explanation, as in the case of the suction pump; at times, applications emerge from the prior establishment of a general principle, as Boyle's law led to an efficient use of steam. Keen perception of this association between science and engineering has made it possible for the authors to compress into a single volume an impressive history of the fields of civil engineering, construction, transportation, and power engineering.

The short chapters on Egypt, Greece, and Rome emphasize the dependence of ancient engineering on massed human labor, despite the emergence of two types of water wheel toward the close of the pre-Christian era. The generalized use of water and wind mills in the Middle Ages is characterized as a revolution in power, which laid the foundations of a new economy. The development of science, beginning with Leonardo da Vinci, freed engineering from the limitations of mere empiricism in the use of pressure media, making possible a further advance in the power economy.

The development of stone work is covered step by step from the Roman arch through the Gothic. In bridge design, the use of wood led to truss designs as early as Palladio, and this innovation, of course, came to have special significance when iron and steel became available. The history of steam transportation on land and water is remarkable for its compactness and comprehensiveness. The outstanding features of the later chapters are the account of the electric industries, the techniques of caisson work, tunneling shields, and suspension bridges.

Despite the wide range of material, the narrative has a structure that is vividly felt and moves with such vigor that it is hard to lay the book down. It is a fine achievement in historical writing.

The study of American technology by John W. Oliver is unusual because of the emphasis on the intimate relationships between science, technology, and culture. Although new discoveries in science and major inventions are fully appreciated, much attention is given to the diffusion of scientific and technical knowledge by scientific societies and to modifications of engineering practice. The narrative is divided into four periods: 1607–1789, 1789–1865, 1865–1900, and 1900 to the present. For each period, the technical features of production and communication are surveyed comprehensively. Agriculture and the processing of agricultural products is, therefore, an integral part of the narrative. Communication, too, is broadly conceived; it includes the development of the newspaper, printing, paper-making, and the whole sequence of electric inventions for the transmission of news and pictorial material.

Although all the topics in each period are fully covered, the arrangement is not stereotyped; hence, the characteristic problems of the different periods are not obscured by a rigid plan.

The development of the economy of the United States is portrayed with great skill and without undue emphasis on any single factor. The book is a notable contribution to the economic and cultural history of the United States and will be invaluable to the general reader and to college students.

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Yellow Fever Vaccination. World Health Organization Monograph Series, No. 30. World Health Organization, Geneva, 1956 (order from Columbia University Press, New York 27). 238 pp. Illus. $5.

In the story of the evolution and practical application of knowledge concerning yellow fever, the subject of vaccination is an important chapter and is very competently discussed in this monograph. An initial section by Smithburn sets the stage for the more technical sections that follow by reviewing the general question of the immunology of yellow fever. Appropriately, he considers in some detail serological methods for demonstrating