Book Reviews

Cottrell—Samaritan of Science. Frank Cameron. New York: Doubleday, 1952. 403 pp.; index. $4.50.

Frederick Gardner Cottrell was an accomplished scientist, a catalyzer of scientists, and a benefactor of science. But above all he was a man of integrity who steadfastly refused to compromise his ideals and whose vision for mankind was frequently ahead of his times. This is a clear account of his life and work which practically all scientists—and many in other fields—may read with interest and profit.

Cottrell was born in Oakland, California, on January 10, 1877. After a boyhood in which he exhibited much ingenuity and a flair for things scientific, he entered the Chemistry Department of the University of California. Here, his dynamic and original approach to problems jolted many instructors out of the worn paths of the textbooks into the trackless jungle of original investigation, and his broad interest in many fields earned from one professor the caustic comment, "Cottrell wanders all over the lot."

After graduation, Cottrell set out for Germany for additional study, visiting most of the important university and industrial laboratories en route. At first, he studied with van't Hoff at the University of Berlin. Later he worked in the laboratory of Ostwald at Leipzig, receiving his Ph.D. degree there after solving a difficult problem which many of his fellow-researchers had refused to tackle, and one which had baffled even Ostwald himself. His Ph.D. examination was passed *summa cum laude,* and van't Hoff commended his thesis as remarkable for its "originality and vigor."

Back at the University of California as a member of the Chemistry Department staff, Cottrell threw himself into his own research program. Soon he had developed a method for the electrical precipitation of smoke, dust, and fumes which led him into industrial applications of his work. He later assigned the patents for this process to the Research Corporation, which he was instrumental in organizing as an agency for developing patents and making grants for basic research.

Cottrell also participated in the formation of the International Auxiliary Language Association, an organization that grew out of investigations undertaken after World War I by committees of the International Research Council, by the American, British, French, and Italian associations for the advancement of science, the American Council of Learned Societies, and other groups of specialists. Cottrell's interest in an international language dated back to 1902, when at a "student Sunday" social gathering at Ostwald's home a discussion of an international language had taken place.

After many years of industrial and governmental work, which took him many times to Europe and less frequently to Tokyo, Cottrell returned to California for his twilight years. Here he died on November 16, 1948, while attending a National Academy of Sciences meeting in Berkeley.

As Ernest O. Lawrence says in the foreword: "It is always an inspiration to oncoming generations to read about the lives of good men who, through their spirit as well as their works, make contributions of lasting importance."

FORREST F. CLEVELAND

Spectroscopy Laboratory
Illinois Institute of Technology

Range Management: Principles and Practices. Arthur W. Sampson. New York: Wiley; London: Chapman & Hall, 1952. 570 pp. $7.50.

The author has combined many years' experience in research, teaching, and observation to produce this comprehensive treatise. The book is written from both an academic and a practical viewpoint. The broad and inclusive subject of range management is covered under four subdivisions. In the first part, "Range Management in Perspective," the world's grazing practices and problems, physiological and ecological principles as applied to range management, characteristics of grazing lands, and the historical development of grazing in America are discussed.

"Native Range Forage Plants" consists of illustrations and descriptions of the more important range grasses, forbs, and shrubs. This subdivision includes a rather large amount of taxonomy and morphology and, although basically important to practical range management, may be considered by many to be out of place in a range management text. With the author's background of experience, the information presented here might well have been developed into a separate textbook on the taxonomic and morphologic characteristics and the grazing value of range plants.

"Improvement and Management of Range and Stock" includes those management practices—reseeding, noxious plant control, grazing systems, supplemental feeding, water developments—that are common to all livestock producers. Technical problems of range condition, forage utilization, range surveys, management plans, and the economic, physical, and social aspects of ranching are presented.

"The Protection of Range Resources and Range Livestock" is the subject of part four. Ways to avoid damage by livestock to timber reproduction, descriptions and pictures of poisonous plants, foraging and predatory wildlife of the range, soil erosion, and administration of the public grazing lands are included in this subdivision.

The objective of this book is to point out that care and management of the nation's range resources should be based on knowledge gained through years of observation, research, and scientific analysis. Broad principles, rather than specific applications, are outlined. Numerous illustrations, a bibliography at the end of each chapter, and definitions of terms

pertinent to the subject complete a book that will assist in promoting the science of range management. It will be a valuable addition to the libraries of botanists, physiologists, ecologists, teachers, students, range administrators, and livestock producers.

A. C. EVERSON

Department of Botany and Range Ecology
University of Arizona

Principles of Plant Physiology. James Bonner and Arthur W. Galston. San Francisco: Freeman, 1952. 499 pp. $5.50.

This book is a pioneer in what will undoubtedly become a widespread movement aimed at modernization of botanical texts too long steeped in the classical intuitive approach. Bonner and Galston have bravely stepped between the fire of the orthodox who cannot tolerate change and of the moderns who will carp at the lack of rigorous intellectual treatment and at the comic-book aspect of some of the illustrations.

Specifically, the authors have attempted a fusion of plant physiology with contemporary biochemistry, much of the latter unfortunately based more upon what is known about animals and bacteria than upon knowledge of plants. Their mode of approach is clearly outlined in the preface. Emphasis upon brevity, decisiveness, and basic principles was sought, and to ensure success in the search "detailed discussions of contradictory views [were] . . . avoided . . . in the hope that a clear conception of [e.g.] translocation will aid the student in organizing and remembering the facts relative to the subject." The authors admit that "such a treatment tends to become dogmatic," but by some curious turn of logic claim to have tried "diligently to avoid dogmatism." That the treatment is dogmatic by virtue of oversimplification can scarcely be doubted. That some degree of dogmatism cannot be avoided in a first enthusiastic attempt to wed the ingrained empiricism of plant physiology to the analytical approach of biochemistry is a certainty.

The physiological content of the text is by and large excellent, although one detects a natural tendency to emphasize those topics nearest the research interest of the authors' institution. Especially welcome are the elimination of lengthy, obscure tables and the substitution of graphs wherever it is possible to describe processes in quantitative terms. The graphs are well chosen and excellently rendered. Welcome also are the relegation of water relations of plants to a position commensurate with their comparative unimportance and the introduction of much modern material on growth.

Presentation of biochemical subject matter is difficult at the elementary level unless one can presume a thorough grounding in theoretical chemistry on the part of the student. The biochemical section of this text appears to be a watered-down version of the senior author's recent general treatment of the subject. Pedagogically, it is doubtful whether the beginning student will acquire a very clear and convincing conception of plant physiological chemistry even with the advantage of numerous, perhaps overly facile, chemical formulas and equations and the whimsical, five-armed ghostly enzyme of Evan Gillespie. In general, the use of illustrations, however competently drawn, at the expense of critically written text would seem to exceed the needs of even a picture-conscious generation.

Because this is a pioneering text and because it is obviously written with vigor and enthusiasm, it should be on the shelf of every physiologist and of those physical scientists who, in unguarded moments, wonder why the life sciences have not yet adopted the language of mathematics.

R. F. DAWSON

Department of Botany, Columbia University

Contributions to Embryology, Vol. XXXIV, Nos. 222 to 230. Carnegie Institution Publ. 592. Washington, D. C.: Carnegie Institution of Washington, 1951. 196 pp. and 58 plates. $9.50; $8.75 paper.

Eight of the nine papers in this new volume of *Contributions to Embryology* deal with primate material (macaque, 3; human, 5) and are equally divided between studies of embryonic development and of the reproductive tract. The ninth, by LaVelle, "A Study of Hormonal Factors in the Early Sex Development of the Golden Hamster," compares the effects of castration of hamsters of both sexes on day 1 after birth and of administration of male sex hormone with the conditions found in normally developing animals. The material in all the papers is presented in the lucid style and with the abundant and well-executed illustrations that have characterized papers in previous volumes.

The most extensive of the four embryological studies describes age groups XIX through XXIII in the series "Developmental Horizons in Human Embryos," planned by Streeter for the survey of the Carnegie Collection. This paper, the fifth by Streeter, was prepared for publication by Heuser and Corner utilizing illustrations and notes assembled by the author prior to his death in 1948. These age groups cover the last ten days of the embryonic period and have an estimated ovulation age of 39 ± 1 to 47 ± 1 days. Tabulated data concerning the 112 embryos, photographs of ones selected from each horizon, and detailed descriptions and figures of the development of the eye, cochlea, kidney, and certain other organs are presented. A graphic plot of embryos in the collection in horizons XI through XXIII provides a growth curve for the period between 22 and 48 days of estimated ovulation age.

Of the three other embryological studies, that by Hines and Emerson, "Development of the Spinal Cord in the Fetal and Infant Macaque, I. Growth, as Increase in Size," analyzes measurements of cord length and of cross-sectional areas at selected levels of the cord in specimens from 66 days of gestation to 14 months postnatally; that by Sensenig, "The