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