orthogenesis as some "inscrutable mystic force," she nevertheless believes in internally directed evolutionary trends of some sort. In the opinion of the present reviewer, all the examples of parallelism that she mentions can be explained on the assumption that similarly constructed, though distantly related, organisms will react similarly to the same or parallel changes in the environment.

To the specialist on the Pteridophyta, Dr. Manton's book will have a value approaching those of Bower and the other great authorities of the past. To the student of plant evolution in general, it will serve as both a stimulus and a challenge to produce similar studies of such high excellence in other groups of plants.

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The Perception of the Visual World. James J. Gibson; Leonard Carmichael, Ed. Boston: Houghton Mifflin, 1950. 235 pp. $4.00.

This book presents an interesting discussion of visual perception, written as only a psychologist thoroughly familiar with the language of the Gestalt school could write. It is an exposition of ideas worked out during a war research project on the visual perceptual problems of the aircraft pilot.

The essential theme is "that visual space-perception is reducible to the perception of visual surfaces, and that distance, depth, and orientation, together with the constancy of objects may all be derived from the properties of an array of surfaces." In line with the concepts of the Gestalt psychologists, who have insisted that the perception of form is a fundamental sense response, and is not merely an intellectualized summation of individual parts of the form, Dr. Gibson makes the hypothesis that the spatial and temporal changes in the retinal image patterns of textured surfaces constitute the fundamental sense response for the perception of depth and distance. The change in the angular size of the details of the texture of surfaces, such as that of the ground as it recedes into the distance, he calls a "gradient." The perception of the slant and apparent distance of the surfaces are immediately and directly perceived through these retinal image gradients.

The greater part of the book is concerned directly with the concepts of gradient, the relationship of the gradient to the retinal image as the stimulus. Not only does this include the concept of texture gradient, but also the convergence of parallel lines in perspective which is a gradient. The relative intensity of shadow or illumination on solid objects constitutes a gradient. Binocular vision and stereopsis are a response to abrupt changes in gradients. Aerial perspective is an aspect of gradient. Of considerable interest, also, is the author's discussion of change of deformations in retinal image gradient with motion; that is, motion of objects and of the observer. Even the rate of changes of motion, a rate of change in gradient, results in a psychologic correlative of acceleration.

Of special interest is Gibson's hypothesis that the so-called size constancy phenomenon (wherein objects are perceived in their true size regardless of their distances) is accounted for in terms of the gradient of textured surfaces. Associated with the perception of gradient is a psychologic size scale carried by each person which provides the basis for perception of the size of objects, the objects always being associated with the gradient of the background surface.

The last chapters cover the controversial subjects of learning, the effect of learning upon perception, and the essence of meaning in perception of form and depth.

It would certainly appear that gradients in retinal image patterns could not of themselves provide a reliable guide to absolute spatial localization. Knowledge of the nature of the detail that makes up the texture of surfaces, as well as postural influences of the individual, must be determining factors. The change in angular size of detail varies inversely as the square of the slant distance from eye to surface, and the gradient has symmetry around the foot of the perpendicular line from eye to surface. Hence, even a vertical surface can exhibit the same gradient of details as can a horizontal one for the same perpendicular distance.

This book provides much food for thought on the general problem of perception, although at times it leaves the critical reader somewhat unsatisfied, as perhaps it should. Much research, as Dr. Gibson points out, will be necessary to validate these hypotheses. The book is recommended for those particularly interested in the visual sense, but even the casual reader will find it readable and instructive.

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Plant Biochemistry. James Bonner. New York: Academic Press, 1950. 537 pp. $6.80.

The subject matter of plant chemistry would seem to be of primary importance to biology as well as to agriculture and substantial segments of industry. It is curious, therefore, that texts dealing with the chemical composition and metabolic activities of plant life have appeared only infrequently over the years; and these have not been notable for their grasp of subject matter or problems. Publication of this text by Bonner has, for the first time, presented the student and the researcher with an integrated source of relatively up-to-date information. Whatever may be found wanting among its pages, this pioneering treatment is bound to prove of substantial use to those interested in plant science and technology.

The author chose one of several possible outlines of subject matter. Indeed, the difficulty inherent in choosing any single organizational pattern is well expressed in his first chapter, ". . . the subject matter of this book is cyclical rather than linear in arrange-