which he writes, and his book reveals an intimate and professional knowledge of his subject. It is not, however, addressed exclusively to a professional audience; while not exactly food for babes, it does not assume an extensive preliminary knowledge of the subject, and the necessary mathematical developments are presented in an elementary way, so that any one who is not averse to recalling his knowledge of elementary algebra and geometry may read the book with pleasure and profit.

A marked characteristic of modern physics is the free and fearless use of hypotheses—a use which would have been regarded as dangerous, or at least unscrupulous, in the days before we had been taught by the example of great masters like Faraday, Kelvin and Maxwell, that hypotheses were the most useful of all the instruments of research. In those days a hypothesis was considered to be justifiable only when its author could look forward with confidence to the time when it should be raised to the greater dignity of a "theory," and perhaps ultimately be proved to be "true." How far we have advanced from this position is indicated by Professor J. J. Thomson's remark that a physical theory is not a creed, but a policy, and by Mr. Campbell's statement (p. 231) that "a false hypothesis is better than none." This attitude must, of course, be thoroughly understood by the reader. He must recognize that the model structures which are used in this book to explain electrical and optical phenomena are not the only ones possible even at the present time; and that, as investigation proceeds, they will have to be modified and in many cases rejected altogether in favor of others which more perfectly represent the results of experience.

H. A. Bumstead

Einleitung in die Experimentelle Morphologie der Pflanzen. Von Dr. K. Goebel. 8vo, pp. vi + 260, with 135 figures. Leipzig and Berlin, B. G. Teubner. 1908. Price 8 Marks.

This book, which is an amplification of a series of lectures delivered by Professor Goebel in the winter of 1906–7, is one of the most suggestive botanical contributions of recent years. Not only botanists of moderate training, but scientific gardeners should be able to read the work, repeat the experiments and devise new ones. The apparatus is usually very simple, as the author says, "a plant, a pot of dirt and a question." Little attention is paid to the direct effect of light, heat, etc., the reader being directed to Pfeffer's "Pflanzenphysiologie," and Goebel's "Organographie" for a discussion of these factors. For experimental work on lower plants, reference is made to Klebs's "Ueber Probleme der Entwickelung."

There is no attempt at completeness, the book being intentionally an introduction rather than a hand-book.

The titles of the five chapters indicate the scope of the work. (1) The Field of Experimental Morphology, (2) Influencing the Form of the Leaf by Internal and External Conditions, (3) Conditions for the Various Development of Main and Side Axes, (4) Regeneration, (5) Polarity.

In addition to the question, *How* does development proceed, there is another, *why* does it so proceed. The book is most deeply concerned with the second question. Plants diverging from the usual form are called freaks; some plants develop one form under moist conditions and another under dry; some plants have juvenile stages quite different from the adult form; injuries often cause a plant to develop in a direction not followed by the normal plant, etc. Experimental morphology attempts to answer the questions raised by such phenomena. That heredity must be reckoned with is not questioned. The acorn gives rise to an oak, and the beech nut to a beech tree; but normal stages in development may be skipped, after a later stage there may be a return to an earlier, and this because the various stages in development are dependent upon internal conditions which may be influenced by external factors. Development may be checked at a certain stage, when conditions for the succeeding stage are not present.

The experiments and inferences from them are numerous and suggestive. It may be that strict morphologists lay too much stress upon heredity and try to explain too many phenomena as due to recapitulation. It would seem to the reviewer that Professor Goebel has underestimated the importance of heredity as much as most morphologists exaggerate it.

CHARLES J. CHAMBERLAIN

SCIENTIFIC JOURNALS AND ARTICLES

The American Journal of Science contains the following articles: "Some New Measurements with the Gas Thermometer," by A. L. Day and J. K. Clement; "Range of the α-rays," by W. Duane; "Alteration of Augite-ilmenite Groups in the Cumberland, R. I., Gabbro (Hessose)," by C. H. Warren; "Studies in the Cyperaceæ. XXVI. Remarks on the structure and affinities of some of Dewey's *Carices*," by T. Holm; "Applications of the Lorentz-FitzGerald Hypothesis to Dynamical and Gravitational Problems," by H. A. Bumstead.

SPECIAL ARTICLES

ELECTRIC DISTURBANCES AND PERILS ON MOUNTAIN TOPS

IN view of the scientific interest that has been aroused by the sudden death of mountaineers on the widely separated peaks of San Gorgonio and Whitney during apparently the same electric storm in June, 1904,[1] the following recent experience of Captain R. M. Brambila, U. S. Infantry, and the writer will be welcomed as furnishing some hint of the power and magnitude of such electric disturbances.

This experience was endured by the party during the regular visit to the automatic weather observatory maintained by the Nevada Agricultural Experiment Station on Mount Rose (altitude 10,800 feet), the dominating peak north of Lake Tahoe (on the California-Nevada state line), and approximately 200 miles north of Mount Whitney.

The storm, which was mainly electric in nature, displayed itself first on the evening of Friday, October 19, 1907, in a heavy cloud mass lying close along the crest of the Carson Range north of Mount Rose, but in no wise involving Mount Rose itself. The flashes of lightning were frequent and heavy. Little thunder, if any, however, was heard. On the morning of the twentieth, when the actual ascent of Mount Rose began, clouds gathered from the direction of Lake Tahoe about the summit, and enveloped it somewhat persistently during the day. The wind did not exceed ten miles per hour, and the temperature remained above freezing.

From the summit itself the cañons below could be seen filled with masses of vapor. As night darkened a moderate storm of hail and snow with rain began to fall. The pack horse, which had been stabled on a terrace just below the observatory, was covered from tail to ears to protect him from the pelting missiles.

[1] The distance between these peaks, which lie on opposite sides of the Mojave Desert, southern California, is approximately 180 miles and the difference in elevation is 5,015 feet, the higher peak, Mount Whitney (altitude 14,515 feet), being the highest mountain in the United States, excluding Alaska.

The death on San Gorgonio, said to be the first case of the kind in San Bernardino County, occurred July 24, 1904, that on Mount Whitney two days later, July 26. Referring to these fatalities, Professor Alexander G. McAdie, quoted in the *Monthly Weather Review*, September, 1904, page 420, says:

The accidents have a scientific interest in that there are but few records of deaths by lightning in this state. But it should be noted that comparatively few people have been exposed to storms at high elevations. Mr. Byrd Surby was killed on the summit of Mount Whitney, within 50 feet of the monument. It was snowing at the time of the accident. It is probably not well known that the variations in the electric potential of the air during a snowstorm are almost as rapid and as great as those prevailing during a thunderstorm. In this present case I am inclined to think that the electrical disturbance was not localized, but simply incidental to a disturbed field which extended well over the high Sierra, Inyo, Panamint and Telescope ranges; also the San Bernardino Range, and probably the mountains of Arizona. This condition lasted perhaps a fortnight.