

of a method of procedure which may be well known to photographers by the fact that it appears to be unknown to nearly all of the working geologists and zoologists with whom it has been discussed.

The utilization of the swing-back to eliminate distortion in the photographs of high buildings has long been known; the subject of this note is the application of the same method to increasing the depth of focus where both foreground and distance are desired, the swing-back being so manipulated as to increase the distance between the lens and the foreground portion of the photographic surface and to lessen the distance to the background portion of the same. The method is of course inapplicable where the objects in the foreground are high, and the element of distortion might bar it for some pictures, but useful applications of the method are many and will occur to all.

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SCIENTIFIC BOOKS

Grundlagen und Methoden der Paleogeographie. Fundamental Problems and Methods of Paleogeography. By DR. EDGAR DACQUÉ, Privatdozent an der Universität München. Gustav Fischer, Jena, 1915.

Dacqué's notable work is a comprehensive review of the literature of paleogeography and of the opinions of many geologists, representing German, Austrian, French, English, American, Swedish, Norwegian, Dutch and Italian thought, regarding the problems of the science. The list of authors cited comprises nearly five hundred names. The citations are so arranged that the views of any thinker on a specific problem are stated in appropriate context with those of others who may or may not agree with him. For the most part they are abstracts or interpretations, but Dacqué's presentation is accurate and impartial to a degree which may even seem lacking in discrimination, since speculations and respectable theories are treated with similar consideration. There is, however, a certain justification for this attitude, paleontology being in a

very speculative stage of development and its problems being open to various tentative solutions. The work having been prepared for courses of lectures given at the University of Munich in 1912-13 and 1913-14 is marked by a didactic character. The advanced student will therefore find in this comprehensive review much that may seem elementary; he will also find much that is suggestive and helpful.

The chief value of the work for American readers lies in the numerous references to foreign writers and to views which are given more serious consideration by European geologists than they commonly are among Americans. In so far as American thought has been influenced by Chamberlin's far-reaching and fundamental studies, it has abandoned some theories to which Dacqué gives credit and has advanced to concepts which he does not discuss.

The introduction and the history of the literature of paleogeography for the past thirty-five years occupy the first forty pages of the work, and are followed by a discussion of the surface and structure of the earth. The statement includes the tetrahedral theory, as well as the disruption of the moon from the earth on the site of the Pacific Ocean, and closes with a consideration of the constitution of the earth on the assumption that the spheroid consists of a core of nickel iron separated from the known lithosphere by a zone of molten, yet rigid, magma, which allows horizontal displacements of the crust to occur. There is a certain parallelism with Barrell's hypothesis of an asthenosphere or zone of weakness, but German speculation suggests the possibility of horizontal movements of the outer crust far in excess of any that have been postulated by American investigators. Thus Dacqué discusses, as being within the range of credible hypothesis, wanderings of the pole amounting to twenty-five degrees of latitude and the even greater displacements of the continental masses postulated by Wegener.

Changes in the position of the pole might occur through absolute change in the position of the earth's entire mass with reference to the axis of rotation, or through relative move-

ment of an outer shell over the internal core, the latter retaining a constant orientation. Astronomical considerations are opposed to an absolute change in the position of the pole, at least during the eras of known geologic history, but they do not interfere with the possibility of a relative movement of an outer earth skin, either as a whole or in continental segments, provided there be no effective change in the position of the center of gravity of the spheroid. According to Wegener, whose speculations were published in the *Geologisches Rundschau* and in *Petermanns Mitteilungen* for 1912, the lighter continental masses, floating in denser material of the lithosphere, might move laterally. Postulating the sharp distinction of density and the plastic though resistant character of the substratum, which permits slow movements, there is, says Dacqué, no reason to deny that great horizontal displacements of the continental masses may occur, if only it can be shown that there are forces which, during prolonged geologic eras, have acted continuously in a constant direction. Finding such a force in deep-seated lateral stress due to the effort toward isostatic equilibrium, Dacqué concludes that we must hereafter take account of great relative crustal displacements with reference to the mass of the spheroid, regarding them, if not as facts, at least as sound working hypotheses.

It is not the purpose of the reviewer to discuss these concepts, but it may be observed that they may appear reasonable or extravagant according to one's previous education. We have learned to accept horizontal displacements of tens of miles. Overthrusts of this magnitude are clearly demonstrated. The generally accepted interpretation of Alpine structure has familiarized European geologists with the thought of much greater horizontal movements which are supposed to have resulted in piling slice upon slice of the superficial strata and basement rocks, far in excess of the ability of rocks to transmit crushing strains. Fifteen years ago Lugeon's extraordinary views were regarded as impossible. Now only a very small minority of his colleagues still opposes them, and the general agreement of the mas-

ters influences the younger generation of European geologists, schooled to accept an interpretation of mountain structure which contradicts the laws of mechanics and physics.

In a chapter on the rise and sinking of lands or changes of the oceanic level Dacqué reviews current theories of the causes of epeirogenic and orogenic movements, as they are represented in the writings of Suess, Wegener, Termier, Lachmann, Andrée, Haug, Daly, and others. The tendency is toward an abandonment of the contraction theory, the assignment of a minor rôle to isostatic adjustment in epeirogenic changes of level, and a return to the old plutonic or thermal hypothesis in some modified form, especially with reference to the subsidence of geosynclines and the subsequent folding and elevation of the accumulated sediments. Alpine studies again furnish the principal basis of European speculation, but there is also an appeal to English and American thought.

The permanence of oceanic basins is a theme which Dacqué discusses with a full appreciation of its importance in paleogeographic studies and of the diametrically opposite views held by various authorities. After a comprehensive review of marine transgressions and recessions over continental areas, he cites the arguments for and against permanence of the oceanic basins, and arrives at a sharp contradiction of evidence, which he proceeds to solve by adopting Wegener's suggestion of floating continents. It was Suess who designated the lighter rock masses, composed chiefly of silica-alumina rocks, as "Sal" and heavier ones, consisting of silica-magnesia materials, as "Sima." Assuming them to be differentiated, *sal* may be conceived to be a more or less continuous skin floating in *sima*, and it may be capable of disruption accompanied by separation of the parts. *Sima* forms the ocean bottoms and underlies the masses of *sal* which are the continents. The Pacific is a very ancient ocean basin; the Atlantic and Indian depressions are young. According to Wegener the Americas have become separated from Europe and Africa, and Dacqué finds therein the origin of the intervening deep. He says:

If in the ancient Pacific from long ago, that is from the opening of the Paleozoic on, the denser Sima lay exposed . . . and if that was the site of the permanent abyss, then has the dense material under the Atlantic and Indian oceans been exposed through displacement of the lighter salic continents, as if by the drawing back of a curtain, and the existing coincidence of the limits of density with the outlines of the continents and oceans is explained. The former invasions of the sea, which are shown to have spread over what are now land areas, are passing transgressions; the Pacific and the continents are permanent, aside from the displacements; the Atlantic and Indian oceans are younger deeps, floored with sima which appears at the surface in consequence of the displacements [of the continents]. Thus the problem of permanence is robbed of its contradictions and in essentials is explained.

The speculative section of the work, occupying 200 pages, thus presents some of the greater problems of geology as the introduction to paleogeography. Another and in the opinion of the reviewer a sounder method is to proceed from the facts of paleogeography toward the solution of those problems.

As a contribution to the science the latter half of Dacqué's work will seem to many the more valuable. In it are assembled the data of sedimentary formations considered as facts appropriate to paleogeographic investigation, estimates of absolute and relative durations of geologic time divisions, and examples of the construction of paleogeographic maps. The facts of stratigraphy and paleontology are admirably summarized, and the assemblage of illustrations constitutes a rich and suggestive reference for students of the subject.

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Plant Life. By CHARLES A. HALL, F.R.M.S. The Macmillan Company, 66 Fifth Avenue, New York, N. Y. Cloth. Pp. 380. Eighty text-figures and seventy-four full-page illustrations. Price six dollars (\$6.00).

Professor Hall has already written several books presenting various phases of nature-study in a popular way, so that experience in the field, in the laboratory and in the study

have combined to make the present volume on "Plant Life" a useful addition to the series. It is addressed, principally, to the amateur botanist and lover of nature, but contains much which should be of interest to teachers of elementary classes.

The treatment follows the general evolutionary order from the lowest plants up to the highest. The excellent descriptions of field characters is an important feature of the work and should enable the beginner to find even the microscopic forms. Interesting bits of information and clever observations afford welcome material to those who wish to brighten their lectures and laboratory work.

The headings of the twelve chapters indicate not only the scope of the book, but also what might be expected in the mode of treatment. The headings are: Asexual Plants; The Development of Sex in Plants and a Study in Evolution; Seaweeds; Fungi and Lichens; Bryophytes—Liverworts and Mosses; Pteridophytes—Ferns, Horsetails and Club Mosses; Phanerogamia, Flowering Plants; Fossil Plants; The Food of Plants and How they Secure It; The Perpetuation of the Race; The Defences of Plants; Ecology; The New Field Botany. There is a general glossarial index.

The illustrations are excellent and most of them are new. In addition to eighty text-figures, there are seventy-four full-page illustrations, twenty-four being from photographs by the author and fifty in color from drawings by C. F. Newall. The binding and typography are in keeping with the high grade of the illustrations.

CHARLES J. CHAMBERLAIN

PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES

THE eighth number of volume 2 of the *Proceedings of the National Academy of Sciences* contains the following articles:

1. *The Absorption Coefficients of Soft X-rays:* C. D. MILLER, Ryerson Physical Laboratory, University of Chicago.

The numerical constants in the relation between the absorption coefficients, the density,