those employed with emission spectra and the difficulties arise from peculiar causes. The close analogy of the effects with those of bright line spectra is well worked out, however, and we must admire the skill shown in tracing out the action of polarization of the white light and varying density of the absorbing vapor in altering the effects.

In the following chapters, several branches of investigation of the Zeeman effect are considered in turn. A short account is also given of the related phenomena of magnetic rotation in vapors and magnetic double refraction. The study of multiple resolutions is traced, from the observation that all lines are not normal triplets to the profoundly significant relation of the commensurability of the components given by Runge. Dissymmetries in the resolution and a shift of the middle component are features of the later study which are reviewed by Zeeman.

A chapter on solar magneto-optics summarizes the results of the study of the magnetic field of sun-spots by Hale and of his first observations on the general field of the sun. This is followed by a chapter describing the important experiments of Zeeman and Winawer on the inverse effect in directions inclined to the field. Undertaken because of its application to the solar magnetic effects, this work has been carried out with the highest skill and resourcefulness. Results have been obtained which undoubtedly bear closely on the solar phenomena and can be applied when sun-spots are again in evidence.

The closing chapter of the monograph, on the relation between magnetic resolution and the chemical nature of the elements, may be characterized as a statement of unsolved problems. In it we are made to feel how young the subject of magneto-optics is, and that in some directions the considerable mass of experimental material has served to show that a connection with other departments of knowledge exists but leaves the nature of the relation highly obscure. Thus, the relation between magnetic resolution and arrangement of the lines in series is clear only for a few elements having low atomic weights and few lines in their spectra. The fact that a series line which is double with no field may change to a simple triplet in the field is an anomaly which affects the whole question of the connection with series relations. There is probably a fundamental relation between magnetic resolution and the pressure effect, but no close correspondence in detail.

A summary of the leading features of several atomic theories and a highly useful bibliography, giving the entire literature arranged according to year of publication, close a volume which will be appreciated by every student of the subject.

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Mountains, their Origin, Growth and Decay. By James Geikie, LL.D., F.R.S., etc. Edinburgh, Oliver and Boyd. 1913. Pp. 311, 80 Pl., 57 Figs. in text.

This volume contains in systematic form the substance of various contributions made by Professor Geikie during the last twenty years, supplemented with much new matter. The author recognizes two classes of mountains, original or tectonic, and subsequent or relict.

Tectonic mountains are due to accumulation or deformation; the former includes the various types of volcanoes as well as glacial and æolian hills; all of which grow by additions to the outside; the latter includes folded, dislocation and laccolith forms, all due to crustal disturbance. The study of tectonic mountains occupies by far the greater part of the work, which is intended to be a non-technical presentation of the subject. Such matters as glacial action, metamorphism, types and causes of folding, structure of the Alps, origin of ocean "deeps" are discussed as simply and easily as though they were familiar topics of every-day conversation. Certainly, this mode of treatment shows that exact scientific method does not require much aside from ordinary language, for one knowing only the general principles of physics and geology can grasp the situation so as to appreciate the difficulties with which an investigator must contend as

well as the great opportunity for erroneous conclusions. The geologist, finding the statements exact, can not complain because the presentation is such as to be attractive to the layman. Subsequent mountains, being merely relics of former highland, receive briefer treatment, and the discussion is confined chiefly to consideration of the various destructive agencies and their action upon the rocks and types of structure.

As one should expect in a work intended mostly for "home consumption," full share of the space is given to such Scottish and English areas as afford proper illustrations; but in this, as in earlier works by Professor Geikie, there is ample evidence of intimate acquaintance with conditions elsewhere, and he has levied contributions upon all parts of the world. The plates, reproductions of photographs from many lands, are of unusual excellence and the text is full of suggestive matter for the geologist in every land.

Some portions of the work are deliciously controversial; the consideration of phenomena in the Pacific basin is thorough and the argument against explanations offered by Suess is put very strongly; some American geologists will regard the opinions respecting isostacy as not altogether orthodox, and several continental geologists will feel convinced that the author does not know so much about Alpine structure as they do. But all, whether accepting or opposing his conclusions, will agree that the tone of his presentation is judicial throughout, as benefits one who has made direct study in a great part of Europe and whose familiarity with the literature is equalled by that of few other geologists.

JOHN J. STEVENSON

The Indigenous Trees of the Hawaiian Islands. By JOSEPH F. ROCK, botanist of the College of Hawaii; consulting botanist, Board of Commissioners of Agriculture and Forestry, Territory of Hawaii. Issued June 26, 1913. With two hundred and fifteen photo-engravings. Published under patronage. Honolulu, T. H. 1913. Large octavo. Pp. viii + 518.

This stately volume includes descriptions of two hundred and twenty-five species of trees which are natives of the Hawaiian Islands. The author tells us in his preface that it had "long been the writer's desire to give to the public a volume on the native trees of Hawaii," so that this work is the result of a protracted study of the interesting vegetation of these isolated islands, and as a consequence is much more authoritative and complete.

The introduction, of 87 pages, gives "a more or less detailed description of all the floral regions, and their plant associations found in this island group, not being restricted to trees alone, but embracing the whole plant covering." In it we are first given a tabular enumeration of the botanical regions, as follows:

1. Strand vegetation.
2. Lowland region (merging into 3).
   (*a*) Dry region.
   (*b*) Wet region.
3. Lower forest region.
   (*a*) Windward side.
   (*b*) Leeward side.
4. Middle forest region.
   (*a*) Dry region.
   (*b*) Semi-dry region.
   (*c*) Wet region.
   (*d*) *Kipukas* (small areas of black, fertile soil in dry regions with no trace of lava, richest in species).
5. Bog region.
6. Upper forest region.

These are described at some length, and are illustrated by many good photo-engravings. On the largest of the islands (Hawaii) the mountains reach elevations of 8,273 feet, 13,675 feet and 13,823 feet, so that there are wide climatic ranges from tropical heat to "almost perpetual snow." Indeed the author sums up his statement in the sentence, "from a phytogeographic standpoint the island of Hawaii offers the most interesting field in the Pacific."

Coming now to the systematic part of the book one finds that no less than forty-five families of plants are represented by species of trees. And yet with all the variety that this implies there is scarcely a familiar genus in