REVIEWS.

THE PRINCIPLES OF ECONOMIC GEOLOGY. By WILLIAM HARVEY EMMONS, Ph.D. pp. xviii + 606, with 210 text-figures. New York: McGraw-Hill Book Company, Inc. London: Hill Publishing Co., Ltd. 1918. Price 24s. net.

IN this book the author presents a perspective of the present position of the scientific knowledge of metalliferous and non-metalliferous mineral deposits, with the exception of fuels and oil. However, the amount of space devoted to the non-metalliferous deposits amount to only about 70 pages out of 600, and it is to all intents and purposes a textbook of the geology of metalliferous mining. The first twenty-one chapters of 290 pages are devoted to a discussion of general principles, while the rest of the book is occupied by descriptions of actual occurrences, classified under the headings of the various metals or non-metals.

This is perhaps scarcely the place to discuss the general question of the rival classifications of ore-deposits, genetic or chemical; nevertheless it may be allowable to point out that the method here adopted presents many practical advantages, and certainly makes reference easy. A genetic classification, such as has been adopted in most of the larger German books, is perhaps more strictly scientific, but it is certainly confusing to the learner, since it brings together a whole lot of deposits which have little in common from the point of view of the miner and metallurgist, however similar their origin may be. On the other hand, an arrangement by metals groups in one chapter or section deposits that may have been formed in a great variety of ways, and a special difficulty presents itself in the case of ores worked for more than one metal. It is clear that an ideal classification has not yet been evolved, and from the nature of the subject it probably never will be. The whole matter is a question of the balancing of advantages and drawbacks, and in our opinion Professor Emmons has acted wisely in choosing as he has done.

The earlier chapters afford an admirable discussion of the general geological, mineralogical, chemical, and physical principles underlying the formation of workable mineral deposits. The metalliferous deposits are classified under eight headings, as magmatic segregations, pegmatite deposits, contact-metamorphic deposits, deposits of the deep vein zone, deposits formed at moderate depths by hot solutions, deposits formed at shallow depths by hot solutions, deposits formed at moderate and shallow depths by cold and meteoric solutions, and sedimentary deposits. This subdivision seems somewhat elaborate; it is very doubtful, for example, whether any real distinction can be drawn between pegmatites and veins of the deep zone, and it is well known that certain pegmatite dykes can be followed laterally or vertically into ordinary quartz veins, as indeed is explicitly admitted by the author, who also recognizes clearly

that most of his groups grade into each other by imperceptible transitions. The whole question really hinges on the extent to which the circulation of meteoric waters has taken part in the processes of ore-formation, and as is generally known more importance is assigned to this agency in America than in Europe, perhaps mainly owing to the influence of Pošepný. In many American writings there are still strong evidences of the survival of the lateral secretion theory of Sandberger, and indeed something very like it is generally put forward in explanation of the origin of the lead-zinc deposits of Missouri and Kansas. Still more common is the conception of vein-formation by downward movement of meteoric waters into a region of high temperature where metals are dissolved and carried to a higher level by subsequent rise of the heated solutions. Acceptance of this theory is rendered difficult, amongst other evidence, by the fact that many deep mines are dry in their lower levels. The common occurrence of distinct ore-zones around and above intrusions is also difficult to explain on this hypothesis. These questions are discussed at length by Professor Emmons, who gives a most interesting summary of the divergent views on the subject, with a statement of the arguments for and against each of them.

A whole chapter is devoted to a detailed discussion of the superficial alteration and secondary enrichment of ore-deposits, so important from the practical point of view. Although the general underlying principles are well understood, certain points are still in need of explanation; it is still somewhat uncertain whether chalcocite and some other sulphides are ever truly primary, although the balance of evidence from observation suggests that they are. The whole process of oxidation, solution, and reprecipitation obviously depends on the chemical and physical conditions prevailing in the different regions of the ground-water, but the chemical changes involved are very complex and not yet fully elucidated.

The second and larger part of the book consists of descriptions of actual occurrences of minerals of economic value. These are very clear and effective, but it is perhaps admissible to remark that in this section a certain want of balance is shown. Descriptions are given of many American deposits of little economic value and still less scientific interest, while the important mining regions of other parts of the world receive scant attention. It may be suggested with all due deference that the object in view would have been better attained by treatment of a smaller number of examples, culled from all parts of the world and selected so as to illustrate general principles. Thus the student of economic geology, for whom the book is primarily intended, would acquire a better sense of proportion and learn to appreciate more fully the scientific and commercial value of certain highly important types of mineral deposit which do not occur in North America.

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