ORE DEPOSITS: A DISCUSSION RE-PUBLISHED FROM THE ENGINEERING AND MINING JOURNAL, NEW YORK, MAY, 1903

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A REVIEW.

The discussion on ore-deposits which appears in this pamphlet is a reproduction of the views expressed before the Geological Society of Washington, at two consecutive monthly meetings, early in 1903, as reported in the *Engineering and Mining Journal*, but it also includes some important corrections and amplifications of the material previously published. In a manner—timely and suggestive—it represents the latest opinions on a subject which is of perennial interest to all those who are engaged either in the academic or the practical pursuit of the ore-bodies valuable to man. The discussion gives particular prominence to the recent accentuation of magmatic differentiation as a factor in the distribution of ores in rocks; this is the reason why the advocates of the agency of water as a determinative process are not so prominent. Mr. Emmons, Prof. Van Hise and other authoritative writers have indeed taken part in the discussion and added largely to the value of it, but their purpose has been evidently more to warn against the exaggeration of a new motif in the geologic drama than to reiterate their own views fully until the new theories have been further substantiated.

The present position of the study—it is not yet an exact science—of ore-deposits is worthy of a brief review. It is summaried herewith in words whose repetition[1] seems warranted as an introduction to the discussion on which the present pamphlet is based.

Mining owes much to geology. This debt will, let us hope, be increased, for it is an honorable obligation. Science justifies herself to the commercial world by the practical aid which she gives to industry. Even those who delve underground for the metals upon which mod-

[1] From an article in the *Engineering and Mining Journal* of Jan. 18, 1902, entitled "Recent Progress in the Study of Ore-Deposits," by T. A. Rickard.

ern civilization depends are not without the realization that light has come to them in dark places.

Geology was not always a friend to mining. In its infancy it made wild statements which only perplexed an exceedingly venerable industry. Even to this day, in certain quarters, there is an unspoken idea that the young science stoops to commercialism when she concerns herself with matters which have to do with mining. A notable example can be instanced. The Geological Society of England was founded by the fathers of modern geology, by men whose names are household words, and among its records will be found the first presentment of the very foundations of the science to which the society is dedicated. I desire to emphasize the historic position and the splendid work, continuing to this day, done by the men who compose that honorable society, which represents all that is best in English geology, but such emphasis will also accentuate the extraordinary fact that, both as a body and individually, English geologists have severely abstained from developing that part of their science which touches most directly upon mining, namely, the study of ore-deposits. In striking contrast to this neglect of a most useful line of enquiry is the attitude adopted by the geologists of the United States, and more particularly by the organized corps of the Geological Survey. From its very inception, under Mr. Clarence King, the Survey has given the warm grasp of friendship to the miner, and during the past twenty-five years the distinguished scientific men who have done its work have contributed, not merely a few suggestions or iridescent generalizations, but the results of practical research of the most useful kind, which have formed the basis for a systematic study of ore occurrence.

Besides its own contributions on a subject of immediate economic importance, the Survey, by the separate writings of certain of its members, has given an impetus to the investigations of mining engineers and others who have collected data for the common fund of ascertained fact. The American Institute of Mining Engineers has served as a link to bring together the official and the pro-

fessional mining geologists, the meeting of men working toward a common purpose by diverse paths having been facilitated by the fact that the distinguished secretary of the Institute was once a government official himself,[1] and is now the dean of the mining engineering profession.

The results of this co-operation are manifest. The literature of that branch of geology which deals with the genesis, structure and occurrence of ore-deposits is, in its modern aspect, distinctively American, and this can be said without under-estimating the inspiration given to the study of these problems by the writings of such men as Posepny, Vogt, Beck, De Launay and other European scientists.

During the past eighteen years the study of ore-deposits, in this country, at least, has received a marked impetus on three notable occasions. These three impulses toward advancement are associated with the names of Emmons, Posepny, and Van Hise. In the history of economic geology the publication of the Leadville monograph[2] marks a red-letter day. Of all reports on the geology of a mining district this one has had a value more directly measurable in dollars and cents. Whatever it may have cost, it is not too much to say that the work of Mr. Emmons and his assistants gave to Leadville an underground chart which has led to the discovery of bodies of ore valued at millions of dollars. And apart from its immediate aid to the mine-captains of one district, it proved a most illuminating guide to the men who opened up the Aspen, Rico and Ten Mile districts in Colorado. As a geological report made by a national survey, it marked a striking advance in its detailed deciphering of the underground structure of a very complicated region; for however interesting and suggestive the questions concerning the origin of ores may be, there is no doubt but that the unraveling of the structural relations of ore-deposits

[1]This refers, of course, to Dr. Rossiter W. Raymond, to whom the mining industry, in its broadest sense, owes a debt which it is pleasant to remember.

[2]Monograph, XII. Geology and Mining Industry of Leadville, by S. F. Emmons. U. S. Geological Survey. Issued in 1886. An abstract, which stated Mr. Emmons' views quite fully, was published in 1882.