

sacrifices already made; in any case the literature for the period from 1896 to 1900 will have been well indexed and an important experiment in view of the Royal Society's undertaking will have been tried.

I should like finally to remind authors and publishers that they can greatly aid in this work by preparing short *résumés* of their publications as recommended in these columns by Professor Bowditch.

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SCIENTIFIC LITERATURE.

Le pétrole, l'asphalte et le bitume, au point de vue géologique. Par A. JACCARD, professeur de géologie à l'académie de Neuchâtel. Ancienne librairie Germer Baillière et cie. Paris. 1895.

This work forms one of the volumes of the Bibliothèque Scientifique Internationale and has been published since the author's death, on the 5th of last January.

The task of reviewing the work of one no longer living imposes upon the reviewer great care that no injustice shall be done the author, either as regards his intention or accomplishment. A very careful perusal of the work has shown that the author was a very close observer of nature, and a man of very positive convictions within the range of his own observations, yet in his final conclusions not too confident of his own infallibility, although at times, along the line of argument that he maintains throughout the work, his language very closely approaches upon dogmatism. He devoted his life to the study of the geology of the Jura, and that portion of France and Switzerland which includes the celebrated deposits of bituminous limestone and sandstone lying in the upper valley of the Rhone, from Neuchâtel to Pymont and beyond. In this work he has included, not

only the results of his own observations, but those of many other writers from the earliest mention made in scientific literature to the present time. I do not question that in respect to this particular department of the general literature of bituminous substances, or, more properly speaking, of bitumen, that this work is without a rival the most complete that has been devoted to the scientific discussion of this subject.

I think it is to be regretted that the author attempted a more ambitious work, and sought to reach general conclusions that, beyond the horizon of his own observations, were based upon the work of others made at various dates and under various conditions, which M. Jaccard appears to have accepted without much discrimination. He further allowed himself to be confined exclusively to works written in the French language which, embracing, as they do, many of the most valuable original memoirs extant, would at the same time exclude all access to the original works of American, English and German writers on the subject. As an illustration he quotes at this date (1895) the conclusions reached by M. Daubré in his 'Rapport du jury de l'exposition internationale de Paris, 1867,' in relation to the petroleum of North America. This paucity of information written in the French language, and injudicious use of French authors who have discussed the subject second hand, renders the work of very little value so far as it relates to American bitumen.

Again, he devotes a considerable portion of the work to the discussion of the 'Origin of Bitumen,' a subject that cannot be discussed from the 'point of view' of geology alone, as it involves a knowledge of both the chemistry and technology of bituminous substances. The apparent lack of knowledge of the details of the chemistry and technology of bitumens has led to many misstatements and invalid conclu-

* Address after September 3d, care of Brown, Shipley & Co., London, E. C.

sions throughout the work. To cite these instances in detail would require too much space, but they will not fail to arrest the attention of those familiar with the subject. It is no doubt to the same fundamental cause that the work owes its grave defects in classification, a defect that appears even in the title. Bitumen is the generic term that includes all forms of petroleum and asphalt. Moreover, no distinction is made between the peculiar use made by French authors of the word *asphalte* as applied to the asphaltic limestones and sandstones of eastern France and Switzerland and the use of the word to designate the solid form of bitumen, in which latter use he has made it the equivalent of 'asphalt' in English. The words naphtha and petroleum, and petroleum and maltha, are also used interchangeably to some extent in some places and with different meanings in others, so that throughout the work the use of these words is not clear. This confusion arises from a disregard of details that belong to chemistry rather than to geology.

As a whole, the work possesses great merits and grave defects; especially is the latter statement true in relation to American bitumen. The work should be read with careful discrimination, which is much to be regretted, as it will doubtless be widely read in Europe, where its merits will be much more apparent than its defects.

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The Glacial Nightmare and the Flood. By SIR HENRY HOWARTH, K. C. I. E., M. P., F. G. S., etc. 2 vols. Pp. 11-920. Sampson, Low, Marston & Co.

This volume is a manual of the facts and changing opinions gathered and expressed by the students of the superficial features of Europe and America from the earliest days of observation, and brings into prominence the names of many excellent men formerly overlooked or forgotten. The work is a fair

history of the rise and decay of the theory of floods, of the universality and restriction of iceberg action, of the origin and culmination of the glacial theory. Thus far the author's views are only seen in the title. On the subject of the unity of the glacial period, the evidence is stated with the writer's judgment favoring one general period of cold. The astronomical theory of the cause of the Ice Age is shown to be unsustained by the evidence. The cause of glacial motion and the mechanical effects of the glaciers are discussed in a masterly manner, with conclusions very acceptable to most of us. The use of the doctrine of an ice cap and its subsequent restriction to continental areas is explained. But now the work is directed against extreme views, which have prevailed or are still dominant, on the ground of want of evidence. In the latter part of the work the writer ceases to be the judicial historian and becomes the philosopher, and explains some phenomena of the drift, carefully analyzed, by an appeal to 'waves of translation,' a modification of the doctrine of catastrophies in contra-distinction to the ideas of extreme uniformity which often need modification. The work is invaluable to the American student on account of giving him access to many of the fathers of superficial geology, whose works are not ordinarily accessible. These works also show how much more had been done by the early observers than is credited to them by most modern writers, partly on account of facts becoming public property in course of time, and partly on account of the impossibility of doing justice to so many men at all times. Yet these men were the intellectual ancestors in the field of surface geology. Another lesson is taught that conclusions of many of the most distinguished writers have not withstood deeper research, and have been replaced by the views of others who in turn will pass behind the curtains of time. Yet the science was originated and devel-